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NATURAL
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ILLUSTRATIONS
OF THE
NATURAL ORDERS OF PLANTS.

VOL. II.



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ILLUSTRATIONS

OF THE

NATURAL ORDERS OF PLANTS

WITH

GROUPS AND DESCRIPTIONS

BY

ELIZABETH TWINING.

REDUCED FROM THE ORIGINAL FOLIO EDITION.

VOL. II.

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CONTENTS OF PLATES.

VOLUME II.

PAGE	
81.	LOBELIACEÆ..... <i>Lobelia Dortmanna</i> . <i>Lobelia splendens</i> . <i>Siphocampylus bicolor</i> . <i>Lobelia littoralis</i> . <i>Clintonia pulchella</i> .
82.	GESNERACEÆ ... <i>Gesnera zebrina</i> . <i>Æschynanthus grandiflorus</i> . <i>Streptocarpus</i> <i>Revii</i> . <i>Cyrtandra staminea</i> . <i>Gesnera allophylla</i> . <i>Gesnera grandiflora</i> .
83.	VACCINIACEÆ ... <i>Vaccinium Myrtillus</i> . <i>Vaccinium Vitis Idæa</i> . <i>Oxycoccus macro-</i> <i>carpus</i> . <i>Thibaudia variegata</i> . <i>Gaylussacia serrata</i> . <i>Vaccinium amœnum</i> .
84.	ERICACEÆ <i>Erica cinerea</i> . <i>Erica tetralix</i> . <i>Erica ventricosa</i> . <i>Arbutus Unedo</i> . <i>Rhododendron ferrugineum</i> . <i>Rhododendron arboreum</i> . <i>Kalmia latifolia</i> . <i>Rhododendron albiflorum</i> .
85.	BELVISIACEÆ ... <i>Napoleona imperialis</i> .
86.	MYRSINACEÆ ... <i>Myrsine retusa</i> . <i>Suttonia divaricata</i> . <i>Ardisia crenulata</i> . <i>Jacquinia</i> <i>aurantiaca</i> . <i>Embelia robusta</i> .
87.	SAPOTACEÆ <i>Achras Sapota</i> . <i>Isonandra gutta</i> . <i>Mimusops Kauki</i> . <i>Chrysa-</i> <i>phyllum Cainito</i> .
88.	EBENACEÆ <i>Diospyros Embryopteris</i> . <i>Diospyros Lotus</i> . <i>Royena pubescens</i> . <i>Diospyros melanoxydon</i> .
89.	OLEACEÆ <i>Olea europæa</i> . <i>Syringa vulgaris</i> . <i>Ligustrum vulgare</i> . <i>Fraxinus</i> <i>pendula</i> .
90.	JASMINACEÆ..... <i>Jasminum officinale</i> . <i>Jasminum fruticans</i> . <i>Nyctanthes arbor</i> <i>tristis</i> . <i>Jasminum hirsutum</i> . <i>Jasminum ligustrifolium</i> . <i>Jasminum gracile</i> .
91.	STRYCHNACEÆ ... <i>Strychnos Tieute</i> . <i>Fagraea littoralis</i> . <i>Spigelia marylandica</i> . <i>Strychnos ligustrina</i> .
92.	APOCYNACEÆ ... <i>Apocynum hypericifolium</i> . <i>Vinca major</i> . <i>Cynanchum nigrum</i> . <i>Nerium Oleander</i> . <i>Allamanda cathartica</i> . <i>Stapelia marginata</i> . <i>Asclepias</i> <i>syriaca</i> . <i>Glossonema Boryanum</i> .
93.	RHIZOPHORACEÆ.. <i>Rhizophora Mangle</i> . <i>Kandelia Rheedii</i> . <i>Carallia zeylanica</i> . <i>Carallia lucida</i> .
94.	GENTIANACEÆ ... <i>Gentiana acaulis</i> . <i>Erythrea centaurium</i> . <i>Chlora perfoliata</i> . <i>Villarsia nymphoides</i> . <i>Chironia decussata</i> . <i>Lisianthus Russellianus</i> . <i>Leianthes nigrescens</i> . <i>Gentiana lutea</i> . <i>Chironia baccifera</i> .
95.	BIGNONIACEÆ ... <i>Bignonia radicans</i> . <i>Eccremocarpus scaber</i> . <i>Catalpa syringifolia</i> . <i>Jacaranda mimosifolia</i> .

CONTENTS OF PLATES.

PAGE

96. POLEMONIACEÆ... *Polemonium caeruleum*. *Gilia tricolor*. *Phlox Drummondii*.
Cobaea scandens.
97. CONVULVULACEÆ . *Convolvulus sepium*. *Convolvulus americana*. *Convolvulus Soldanella*. *Ipomea purpurea*. *Convolvulus tricolor*. *Ipomea quamoclit*.
Cuscuta epithymum.
98. BORAGINACEÆ ... *Borago officinalis*. *Cerinthe major*. *Tournefortia cymosa*.
Myosotis palustris. *Symphytum*. *Ehretia*.
99. HYDROPHYLLACEÆ *Hydrophyllum virginicum*. *Hydrolea spinosa*. *Eutoca viscida*.
Nemophila phaceloides.
100. SOLANACEÆ *Solanum Dulcamara*. *Nicotiana tabacum*. *Solanum Lycopersicum*.
Juanulloa parasitica. *Capsicum baccatum*. *Brugmansia sanguinea*. *Petunia*.
Hyoscyamus. *Datura Stramonium*.
101. SCROPHULARIACEÆ *Scrophularia aquatica*. *Digitalis purpurea*. *Linaria vulgaris*.
Veronica chamædrys. *Minulus moschatus*. *Chelone barbata*. *Torenia asiatica*.
Antirrhinum majus. *Calceolaria*.
102. LAMIACEÆ *Lamium maculatum*. *Salvia patens*. *Galeobdolon luteum*.
Scutellaria cordifolia. *Betonica grandiflora*. *Salvia*. *Lavandula*.
103. OROBANCHACEÆ . *Orobanche minor*. *Lathrea squamaria*. *Æginetia pedunculata*.
104. VERBENACEÆ ... *Verbena officinalis*. *Verbena chamædrifolia*. *Clerodendrum fallax*.
Lantana aculeata. *Myoporum parvifolium*. *Callicarpa*.
105. ACANTHACEÆ ... *Acanthus spinosus*. *Justicia carnea*. *Thunbergia alata*. *Strobilanthes*.
106. UTRICULARIACEÆ. *Utricularia vulgaris*. *Utricularia Humboldtiana*. *Utricularia reticulata*.
Pinguicula vulgaris.
107. PRIMULACEÆ ... *Primula veris*. *Dodecatheon Meadia*. *Cyclamen europeum*.
Anagallis arvensis. *Anagallis Monelli*. *Aretia*.
108. PLUMBAGINACEÆ. *Plumbago capensis*. *Plumbago rosea*. *Statice purpurata*.
Armeria vulgaris.
109. PLANTAGINACEÆ. *Plantago major*. *Plantago coronopus*. *Plantago squarrosa*.
Littorella lacustris. *Bougueria rubicola*.
110. NYCTAGINACEÆ... *Mirabilis Jalapa*. *Mirabilis longiflora*. *Abronia mellifera*.
Pisonia obtusata.
111. AMARANTACEÆ... *Amarantus Blitum*. *Amarantus caudatus*. *Celosia cristata*.
Gomphrena officinalis.
112. CHENOPODIACEÆ.. *Chenopodium bonus Henricus*. *Beta maritima*. *Spinacia oleracea*.
Basella rubra. *Blitum virgatum*. *Salsola Kali*. *Salicornia herbacea*.
113. PHYTOLACCACEÆ.. *Phytolacca decandra*. *Rivina tinctoria*.
114. BEGONIACEÆ..... *Begonia semperflorens*. *Begonia diversifolia*. *Begonia sanguinea*.
Begonia manicata. *Diplocinium Evansianum*.
115. POLYGONACEÆ ... *Polygonum Persicaria*. *Polygonum orientale*. *Rheum spiciforme*.
Coccoloba uvifera.
116. LAURACEÆ *Laurus nobilis*. *Cinnamomum javanicum*. *Persea gratissima*.
Debaasia media.
117. MYRISTICACEÆ ... *Myristica moschata*. *Virola sebifera*.
118. PROTEACEÆ *Protea pulchella*. *Grevillea longifolia*. *Telopea speciosissima*.
Leucospermum hypophyllum. *Hakea acicularis*. *Hakea undulata*.
Banksia media. *Banksia speciosa*.

CONTENTS OF PLATES.

- PAGE
119. THYMELACEÆ ... *Daphne mezereum*. *Daphne laureola*. *Dais laurifolia*. *Dirca palustris*. *Pimelia spectabilis*. *Lagetta lintearia*.
 120. SANTALACEÆ..... *Santalum album*. *Thesium linophyllum*. *Leptomeria Billardieri*. *Leptomeria acida*.
 121. ELÆAGNACEÆ ... *Elæagnus angustifolia*. *Elæagnus argentea*. *Hippophæ rhamnoides*. *Myrica gale*. *Myrica javanica*. *Myrica cerifera*. *Comptonia*.
 122. ARISTOLOCHIACEÆ *Aristolochia Clematilis*. *Aristolochia Siphon*. *Aristolochia gigas*. *Asarum europæum*. *Bragantia*.
 123. EUPHORBIACEÆ... *Euphorbia Peplus*. *Euphorbia splendens*. *Jatropha integerrima*. *Poinsettia pulcherrima*. *Euphorbia pentagona*. *Hura crepitans*.
 124. ARTOCARPACEÆ... *Artocarpus incisa*. *Ficus carica*. *Morus nigra*. *Dorstenia hispida*.
 125. URTICACEÆ *Urtica pilulifera*. *Cannabis sativa*. *Humulus lupulus*. *Urtica dioica*.
 126. PIPERACEÆ *Piper nigrum*. *Piper Betle*. *Piper ribesioides*. *Piperomia aricarinata*. *Artanthe elongata*. *Chavica Roxburghii*.
 127. AMENTACEÆ..... *Quercus pedunculata*. *Corylus Avellana*. *Fagus sylvatica*. *Castanea vesca*. *Salix viminalis*. *Salix herbacea*. *Betula pendula*.
 128. CONIFERACEÆ ... *Pinus maritima*. *Juniperus communis*. *Taxus baccata*. *Larix Cedrus*. *Wellingtonia*. *Araucaria*. *Cryptomeria japonica*.
 129. CYCADACEÆ *Cycas revoluta*. *Cycas circinalis*. *Zamia*.
 130. HYDROCHARIDACEÆ *Hydrocharis Morsus-ranæ*. *Stratiotes aloides*. *Vallisneria spiralis*. *Boottia cordata*. *Anacharis alsinastrum*.
 131. ALISMACEÆ *Alisma plantago*. *Sagittaria sagittifolia*. *Butomus umbellatus*. *Limncharis Humboldtii*. *Damasonium indicum*. *Alisma ranunculoides*. *Limncharis Plumieri*.
 132. ORCHIDACEÆ..... *Orchis mascula*. *Ophrys apifera*. *Oncidium Papilio*. *Sobralia macrantha*. *Phalenopsis amabile*. *Dendrobium fimbriatum*. *Huntleya violacea*. *Vanilla planifolium*. *Epipactis grandiflora*.
 133. ZINGIBERACEÆ ... *Zingiber officinale*. *Hedychium speciosum*. *Alpinia cardamomum*. *Mantisia saltatoria*.
 134. MUSACEÆ..... *Musa paradisiaca*. *Strelitzia regina*.
 135. HÆMODOURACEÆ... *Hæmodorum planifolium*. *Anigozanthus coccinea*. *Barbacenia Veitchii*. *Barbacenia Alexandrina*. *Hæmodorum spicatum*.
 136. AMARYLLIDACEÆ . *Amaryllis belladonna*. *Galanthus nivalis*. *Alströmeria aurantiaca*. *Hæmanthus coccineus*. *Sternbergia lutea*. *Phycella ignea*. *Narcissus moschatus*.
 137. IRIDACEÆ..... *Iris pseud-acorus*. *Iris germanica*. *Tigridia pavonia*. *Sparaxis tricolor*. *Gladiolus psittacinus*. *Crocus vernus*.
 138. BROMELIACEÆ ... *Bromelia Ananas*. *Æchmea discolor*. *Tillandsia acaulis*. *Bromelia Pinguin*. *Bromelia fastuosa*. *Pitcairnia ringens*.
 139. DIOSCORACEÆ ... *Dioscorea triphylla*. *Testitudinaria elephantipes*. *Tamus communis*. *Dioscorea adenocarpa*.
 140. SMILACEÆ..... *Smilax maculata*. *Ruscus aculeatus*. *Convallaria majalis*. *Paris quadrifolia*. *Trillium sessile*. *Polygonatum multiflorum*.
 141. LILIACEÆ..... *Lilium speciosum*. *Polianthes tuberosa*. *Hemerocallis flava*. *Fritillaria Melcegris*. *Tulipa sylvestris*. *Scilla nutans*.
 142. COLCHICACEÆ ... *Colchicum autumnale*. *Melanthium junceum*. *Kreysigia Cunninghamii*. *Veratrum nigrum*.

CONTENTS OF PLATES.

PAGE

143. COMMELINACEÆ... *Commelina caelestis*. *Tradescantia zebrina*. *Dichorisandra thyrsiflora*. *Cyanotis axillaris*. *Tradescantia virginica*. *Ancilema*.
144. JUNCACEÆ *Juncus conglomeratus*. *Juncus triglumis*. *Luciola sylvatica*. *Narthecium ossifragum*.
145. PALMACEÆ *Chamerops humilis*. *Phoenix dactylifera*. *Calamus palustris*. *Sagus Rumphii*. *Cocos nucifera*. *Phytelephas macrocarpa*. *Elais*.
146. PANDANACEÆ ... *Pandanus spiralis*. *Freycinetia imbricata*.
147. TYPHACEÆ *Typha latifolia*. *Sparganium simplex*.
148. ARACEÆ *Arum maculatum*. *Richardia æthiopica*. *Amorphallus bulbifer*. *Lemna gibba*. *Arum tortuosum*. *Pistia stratiotes*. *Acorus calamus*. *Calla palustris*.
149. CYPERACEÆ *Cyperus fuscus*. *Carex arenaria*. *Carex stricta*. *Eriophorum polystachion*. *Scirpus tuberosus*. *Scirpus maritimus*. *Isolepis acicularis*. *Carex rivularis*.
150. GRAMINACEÆ ... *Triticum æstivum*. *Hordeum distichon*. *Zea Mays*. *Saccharum officinarum*. *Panicum italicum*. *Phalaris canariensis*. *Phileum pratense*. *Briza media*. *Coix lacryma*. *Agrostis alba*.
151. NAIADACEÆ *Najas marina*. *Zannichellia palustris*. *Triglochin palustre*. *Potamogeton perfoliatum*. *Zostera marina*. *Ouviranda fenestralis*.
152. EQUISETACEÆ ... *Equisetum sylvaticum*. *Equisetum hyemale*. *Equisetum fluviatile*. *Equisetum variegatum*.
153. LYCOPODIACEÆ... *Lycopodium inundatum*. *Lycopodium acrostachyum*. *Pilularia globulifera*. *Isoetes setacea*. *Marsilea polycarpa*. *Marsilea quadrifolia*. *Phylloglossum Drummondii*.
154. FILICACEÆ *Ophioglossum vulgatum*. *Asplenium marinum*. *Scolopendrium vulgare*. *Adiantum reniforme*. *Fadeynia prolifera*. *Acrostichum alaicorne*. *Platyoma ternifolia*. *Doryopteris sagittifolia*. *Anemia collina*. *Danæa elata*.
155. BRYACEÆ..... *Bryum ligulatum*. *Sphagnum latifolium*. *Dicranum glaucum*. *Polytrichum commune*. *Orthotrichum crispum*. *Hypnum Menziesii*. *Leucodon tomentosus*. *Hymenostoma encalyptoides*. *Andræa nivalis*.
156. MARCHANTIACEÆ. *Marchantia polymorpha*. *Marchantia hemisphærica*. *Marchantia assamica*. *Rebouilia graminosa*. *Lunularia vulgaris*. *Aneura proceros*. *Targionia hypophylla*. *Anthoceros levis*. *Duriæa helicophylla*. *Riccia eudichotoma*. *Jungermannia bidentata*. *Jungermannia sinuosa*.
157. CHARACEÆ *Chara vulgaris*. *Nitella flexilis*. *Nitella translucens*.
158. LICHENACEÆ ... *Cetraria islandica*. *Sticta pulmonacea*. *Roccella tinctoria*. *Parmelia parietina*. *Cenomyce pyxidata*. *Cenomyce rangiferina*. *Cenomyce uncialis*. *Stereocaulon paschale*. *Variolaria lactea*. *Ramalina fraxinea*. *Usnea barbata*.
159. FUNGACEÆ *Agaricus campestris*. *Amanita muscaria*. *Agaricus luteus*. *Boletus subtomentosus*. *Boletus sanguineus*. *Polyporus squamosus*. *Scleroderma citrinum*. *Peziza coccinea*. *Cyathus striatus*. *Mucor mucedo*. *Botrytis curta*. *Erineum juglandis*.
160. FUCACEÆ *Fucus vesiculosus*. *Fucus nodosus*. *Himanthalia lorea*. *Delesseria sanguinea*. *Iridæa edulis*. *Sargassum bacciferum*. *Furcellaria fastigiata*.

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LOBELIACEÆ.

THE LOBELIA TRIBE.

SHRUBS, and herbaceous plants, having an acrid milky juice. The leaves are alternate, without stipules. The flowers grow at the ends of the branches, or from the base of the leaf-stalk. The calyx is above the ovary, five-lobed or entire; the corolla is formed of one petal inserted into the calyx, irregularly five-lobed or deeply cleft, and sometimes split down nearly to the base, allowing the pistil and stamens to protrude. The stamens are five, inserted into the calyx alternately with the lobes of the corolla; the anthers cohere in a tube around the pistil. The ovary is below the calyx, with from one to three cells, containing numerous ovules, the style is single, surmounted by a stigma having a cup-like fringe. The fruit is a capsule, with one or more cells, containing many seeds, attached either to the central axis, or to the lining of the seed-vessel, gaping at the summit; the seeds contain fleshy albumen.

These plants have most affinity with Campanulaceæ; the anthers being united in a tube form a connecting link with the Compositæ tribe.

A milky juice of excessive acidity exists throughout the Tribe; in some species it contains caoutchouc.

Lobelia was named by Pohl, in honour of Lobel, a Fleming, who was appointed botanist to James I., and died in London, 1616. This is one of the first instances of a plant receiving the name of a living person, and one who was not associated with its discovery. The genus contains several brilliant species, which are highly ornamental to the flower-garden, although nearly all contain a considerable portion of deleterious juice, some species so much as to be poisonous, others are of value medicinally in their native countries. *Lobelia Dortmanna* (1) is the most delicately graceful of the British species, occurring only in a few situations, but there abundantly, as in the shallow borders of Windermere, and the lake of Glencoe, Scotland. The leaves proceed chiefly from the root, and are divided internally by a longitudinal partition into two cells. *L. urens*, of Devonshire, grows on heaths

1. <i>Lobelia Dortmanna</i> , <i>Water Lobelia</i> .	3A <i>Stamens and Pistil</i> .
Britain.	3B <i>Pistil</i> . 3C <i>Stamens</i> .
2. <i>Lobelia splendens</i> , <i>Splendid Lobelia</i> .	3D <i>Stamen</i> . 3E <i>Section of Ovary</i> .
Mexico.	4. <i>Lobelia littoralis</i> , <i>Shore Lobelia</i> .
2A <i>Pistil</i> . 2B <i>Stamens</i> .	New Zealand.
2C <i>Section of Ovary</i> .	5. <i>Clintonia pulchella</i> , <i>Pretty Clintonia</i> .
3. <i>Siphocampylos bicolor</i> , <i>Two-coloured Siphocampylos</i> .	Colombia.
Georgia.	Z

and commons in the neighbourhood of Axminster; the whole plant is milky and extremely acrid, the juice blistering the skin; the flowers are of a bluish purple colour. This species belongs also to France and Spain. *L. cardinalis* was the first foreign specimen introduced to our gardens from North America: it was soon found to be sufficiently hardy to bear the English climate, and was generally cultivated, but has since been surpassed in beauty by *L. splendens* (2), one of the numerous beautiful plants discovered by Humboldt in Mexico. The lowly little species, *L. littoralis* (4), is a humble contrast to those of America, not only in form of growth, but the flowers are destitute of their bright colouring. *L. inflata* is used as a medicine in North America, though dangerous if taken in too large quantities. *L. excelsa* is probably one of the finest species of the tribe, rising to the height of twelve or fifteen feet in its native country of Nepal, the lower leaves are a foot in length. *L. rosea*, of the same region, bears numerous beautiful rose-coloured flowers. *L. debilis* was discovered by the younger Linnæus at the Cape of Good Hope. *L. camporum* inhabits fields in Brazil. *L. nana* forms part of the vegetation in the highest region of flowering plants on the Andes, at an elevation of 12,000 feet. *L. chinensis* is a creeping plant in the neighbourhood of Canton. *L. ramosa* adorns the plains bordering the Swan River with its bright blue flowers; thus every division of the globe contributes some species to the genus. The flower of *Siphocampylos* has a curved tube. *S. bicolor* (3) is an elegant plant, flowering freely. *S. caoutchouc* yields a small supply of glutinous substance from the milky juice. *Clintonia* (5) very nearly resembles *Lobelia*. The corolla of *Isotoma* is parted into nearly equal segments. *I. longiflora* is of so poisonous a nature as to cause the death of horses that feed on it in St. Domingo and Spain. *Tupa Feuillæi* of Chile is supposed to be the most injurious of the Tribe; the odour of the flowers alone producing sickness. The only wholesome plant is probably *Centropogon surinamensis*, the succulent fruit of which is said to be eatable.

The plants of this Tribe abound in the West Indies, in Brazil, at the Cape of Good Hope, along the range of the Himalaya, and in the Sandwich Isles; they also exist in considerable numbers in Chile and in New Holland. Two species of *Lobelia* extend to Britain.

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Gesneria
The Gesneria Tribe

Day & Son, Limited.

GESNERACEÆ.

THE GESNERA TRIBE.

SHRUBS and herbaceous plants, of a somewhat fleshy nature, and soft wood; sometimes having a climbing or creeping habit: some have tuberous roots. The leaves are generally rough or downy, without stipules, generally opposite, or in circles on the stalks. The flowers are usually in branching clusters, or panicles, rarely solitary. The calyx is partly adherent to the ovary, five-parted at the top. The corolla is composed of one petal, tubular, more or less irregular, five-lobed. The stamens are two or four, one pair longer than the other; the rudiment of a fifth is sometimes present between the short pair: the anthers often cohere, are two-celled, and have an enlarged connective between the two lobes. The ovary is half above the calyx, one-celled, with two fleshy two-lobed projections from the edge; the disk is a fleshy ring studded with glands; the style is continuous with the ovary, the stigma capitate or concave. The fruit is a dry capsule in *Gesnera*, or succulent in *Cyrtandra*; one-celled, with numerous minute seeds fixed to the projecting plates: their outer covering is thin, with fine veins, sometimes clothed with long hairs, or bordered with a wide wing: they contain fleshy albumen, or none.

These plants have some affinity with *Campanulacæ*, and in outward appearance they partly resemble *Bignoniacæ*.

Slightly aromatic and mucilaginous properties exist in a few of the fruits.

Gesnera, which gives the name to this Tribe, was named after the famous Conrad Gesner, of Zurich, learned in all branches of natural history, philosophy, and literature, called the Swiss Pliny: he died in 1565, after having restored the science of natural history to a higher position than it had held since the time of Aristotle and Theophrastus. He founded the Botanic Garden and the Museum in his native city.

The various species of *Gesnera* adorn the fields and woods of Brazil and other hot countries of South America. The calyx and fruit yield a dye used by the

1. <i>Gesnera zebrina</i> .	South America.	5A. <i>Tuber of Gesnera allophylla</i> .
2. <i>Æschynanthus grandiflorus</i> .	Khorea.	5B <i>Pistil with Glands</i> .
3. <i>Streptocarpus Rexii</i> .	Cape of Good Hope.	5C <i>Stamens</i> . 5D <i>Seed magnified</i> .
4A. <i>Cyrtandra staminea</i> , Flower.		6A. <i>Flower of Gesnera grandiflora</i> .
4B <i>Calyx</i> .	4C <i>Pistil</i> .	6B <i>Ovary with Calyx</i> .
4D <i>Fruit</i> .	4E <i>Section</i> .	6C <i>Section of Fruit</i> .
4F <i>Seed</i> .	4G <i>Hair magnified</i> .	

natives for cotton and straw-work, and several other purposes. The succulent fruit is sweet and considered eatable. *G. zebrina* (1) is one of the most beautiful species in foliage and flowers. *Æschynanthus grandiflorus* (2) is an example of that section of the Tribe the seeds of which have no albumen, and the manner of growth being of a parasitical nature. It throws out rootlets at the joints, and is of an aspect very similar to that of an air-plant in the Orchis tribe. *Streptocarpus* (3) is remarkable for the long twisted capsule, differing from the rest of these plants in that respect. The numerous seeds ripen well in this climate, and it is also of easy culture by dividing the roots; its delicately coloured flowers are extremely ornamental and elegant. *Cyrtandra* (4) is an example of the flowers having only two stamens, and of the fruit being a berry; several species are natives of the Sandwich Isles, and of Java. *Chirita* is one of the numerous and beautiful genera of this tribe which abound in damp warm valleys of the Himalayas; there also *Didymocarpus* and *Calosacme* flourish in considerable profusion, reaching to 8000 feet of elevation. *Gloxinia* is one of the most known of the South American genera, and has afforded several valuable plants for the embellishment of European conservatories; the flowers being of various shades of pale purple or pink. *Sarmienta* yields a useful emollient in Chili. *Columnnea scandens* is a climbing plant of South America, the flowers of which secrete a large quantity of honey; it has therefore been named by the French colonists *Liane à sirop*. *Klugia* is a native of Mexico. *Achimenes* is a genus first introduced from Jamaica, and named *Cyrilla pulchella*, now known as *A. coccinea*. *A. longiflora* was discovered in ravines in Guatemala, and sent to England in 1840; the remarkable character of the formation of the flower is the extreme flatness of the corolla at the top of its long curved tube. It also affords an example of the change of colour which a flower undergoes during its expansion from the bud; in the early state, whilst the lobes of the corolla are small and still folded over each other at the top of the tube, they are of a pale yellowish hue, the tube a dull purple; when fully grown and expanded, they acquire a bright purple, and the tube becomes of a yellowish green colour. *Alloplectus sparsiflorus* is one of the most brilliant flowers of the evergreen woods of Rio Janeiro; the calyx and bracts are crimson, the corolla golden and extremely beautiful.

This Tribe is dispersed in each portion of the world, but in very different numbers. Gesnera and its immediate allies belong entirely to the Tropical and hot regions of America. Other genera are natives of Asia; *Streptocarpus* of the Cape of Good Hope; *Fieldia* of Australia; *Ramondia* and *Haberlea* are found in Europe.

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1a 1b 3a 2a 2b 2c

3a 3b 3c 3d

E.T. del.

VACCINIACEAE
The Cranberry Tribe

Day & Son, Limited

VACCINIACEÆ.

THE CRANBERRY TRIBE.

SMALL trees and shrubs, much branched, often angular irregularly, frequently evergreen, sometimes rooting on other trees. The leaves are alternate, undivided, without stipules, often having resinous glands on the notches at the edges, and on the under surface. The flowers are solitary or on branches. The calyx is above the ovary, entire, or with four to six lobes. The corolla is of one petal, lobed like the calyx. The stamens are distinct, twice as many as the lobes of the corolla, inserted into a disk; the anthers have two cells, bursting by pores at the top, and sometimes two horns. The fruit is a fleshy berry crowned by the remaining portion of the calyx, succulent, having four to ten cells, with one or many seeds in each. The seeds are minute, and contain fleshy albumen.

This Tribe has most affinity with Ericaceæ.

Astringent properties prevail in the bark and leaves; subacid in the fruit.

Vaccinium is a genus of which Britain possesses a few species, North America several. *V. Myrtillus* (1) is frequently seen in favourable localities, in rocky woody places, in the southern counties of England, but is much more abundant in the north. In Cumberland, it adorns the wooded banks of glens and waterfalls, as well as the more open heaths and commons. In the Highlands of Scotland it is so plentiful as to afford a supply of food to the moor-game, and also much employment to the poor people, who collect the fruit to sell in the market towns for preserving with sugar for winter use. In the form of jelly it is usually one of the various ingredients of a traveller's repast at a village inn. When the berries are ripe, it is a remarkably pretty plant; but in Switzerland it becomes a much more striking embellishment to the scene, particularly when in autumn the leaves change to red. On the highest part of the Simplon Pass the ground is covered with it in a dwarf state, but the tinted foliage adds a very pleasing effect amidst the wide dreary tracts. *V. Vitis Idæa* (2) the Cowberry, is a smaller plant, usually not more than four or five inches high; this is also an Alpine species, and is found in considerable

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| 1. <i>Vaccinium Myrtillus</i> , <i>Black Whortle-berry</i> .
Britain.
1A <i>Stamen</i> . 1B <i>Seed</i> . | 4. <i>Thibaudia variegata</i> , <i>Variegated Thibaudia</i> .
Himalayas.
4A <i>Stamen and Pistil</i> . |
| 2. <i>Vaccinium Vitis Idæa</i> , <i>Red Whortle-berry</i> , or
<i>Cowberry</i> .
Britain. | 4B <i>Pistil</i> . 4C <i>Stamen</i> .
4D <i>Section of Ovary</i> . |
| 3. <i>Oxycoccus macrocarpus</i> , <i>Large Cranberry</i> .
America.
3A <i>Stamen</i> . | 5. <i>Gaylussacia serrata</i> , <i>Mountains of Silhet</i> .
6A. <i>Vaccinium amœnum</i> , <i>Stamen</i> .
6B <i>Section of Fruit</i> . 6C <i>Section of Seed</i> . |

abundance in the north of England, and in all mountainous districts of Europe. In Sweden and Norway, a preserve of the fruit is a constant accompaniment to roast meat. *V. uliginosum*, the Bilberry, is another British species, with large black fruit, the juice more acid, less wholesome, and said to possess narcotic qualities. *V. formosum*, of China, is esteemed sacred; the flowers come forth at the beginning of the year, and are then used as religious offerings by the Chinese in their temples. *V. padifolium* is an evergreen shrub of Madeira: *V. meridionale* of Jamaica. *Oxycoccus* derives its name from the Greek of *acid berry*; the slender revolute petals distinguish it from *Vaccinium*. *O. macrocarpus* (3) is the well-known American Cranberry, an early importation from North America; although it can be cultivated in peat districts in this country, the fruit is neither so abundant nor good. *O. palustris*, the British Cranberry, is plentiful in watery bogs of Cumberland and elsewhere; the fruit is agreeable when cooked, and much eaten in the northern counties. The silversmiths of Sweden employ it for an acid to destroy the external particles of copper alloy in silver plate.

Thibaudia has a more highly developed corolla than is usual in this tribe, and has less of an Alpine character, although the different species inhabit lofty mountains. Some flourish on the Andes of Peru and Quito, and some on the mountains of New Granada; others grow on the Himalayas and Neilgherries of India. *T. variegata* (4) is a native of the mountain-forests of Silhet, the flowers appearing in the cool season, the seed ripening in July. *T. macrophylla* bears abundant fruit, which is made into wine. The flowers of *T. Quereme* yield an aromatic tincture to the Peruvians, who esteem it as a remedy for toothache. *Gaylussacia serrata* (5) is another of the small evergreen shrubs which adorn the mountains of Silhet, flowering in February. *Gaylussacia* is found also in Java.

This Tribe abounds in the Temperate regions of the world, particularly in swampy or subalpine countries; some species inhabit the mountains of Central Asia, others belong to the Andes of South America, where a few are parasitical: some are natives of North America, and some belong to the moors, marshes, and mountains of Europe.

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ERICACEÆ.

THE HEATH TRIBE.

TREES, shrubs, and undershrubs; the leaves are evergreen, entire, whorled or opposite, without stipules. The inflorescence is variable, the flower-stalks generally have small bracts at their base. The calyx is four or five cleft, nearly equal, placed below the ovary, and persistent. The corolla is of one petal, four or five cleft, like the calyx, occasionally separable into four or five petals, regular or irregular. The stamens are equal in number to the divisions of the corolla, or twice as many; the anthers are two-celled, separate either at the apex or base by a disk, or secreting scales; the fruit is a capsule, many-celled, and many-seeded, opening in various ways, rarely a berry, as in *Arbutus*; the seeds are minute.

This extensive tribe may be divided into two sections. The true Heaths are amongst the most delicately beautiful of plants, but have scarcely any valuable properties; only a few of the succulent berries of some genera are eatable. *Rhododendron* and its allies are noble ornaments of the countries where they grow naturally, and contribute highly to the embellishment of those to which they have been transplanted; in this section dangerous narcotic qualities prevail.

Erica was known only in its humble European species till towards the close of the last century, when vast numbers were discovered at the Cape of Good Hope by Francis Masson. The neatness of the foliage, and the graceful elegance of the flowers, which are of considerable duration, render them worthy of the skill which has made their cultivation so successful in England. *Erica cinerea* (1) is extremely abundant in many parts of Britain, combining with *Calluna vulgaris*, Ling or Heather, to adorn the barren commons and moors with brilliant purple flowers, affording food and shelter to birds, and thatch for the cabins of the peasants in the northern districts. *E. tetralix* (2) is a less common species, of much beauty, although the flowers are confined to a small terminal cluster.

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| 1. <i>Erica cinerea</i> , <i>Five-leaved Heath</i> . Britain.
1A <i>Stamen</i> . | 5. <i>Rhododendron ferrugineum</i> , <i>Rusty-leaved Rhododendron</i> . Switzerland.
5A <i>Stamen</i> . 5B <i>Pistil</i> . |
| 2. <i>Erica tetralix</i> , <i>Cross-leaved Heath</i> . Britain.
2A <i>Stamen</i> . 2B <i>Pistil</i> . | 6. <i>Rhododendron arboreum</i> , <i>Tree Rhododendron</i> . Himalayas. |
| 3. <i>Erica ventricosa</i> , <i>Porcelain Heath</i> .
Cape of Good Hope. | 7. <i>Kalmia latifolia</i> , <i>Broad-leaved Kalmia</i> .
North America. |
| 4. <i>Arbutus Unedo</i> , <i>Strawberry Tree</i> .
S. Europe and Ireland. | 8. <i>Capsule of R. albiflorum</i> . |

Arbutus Unedo (4) seems to have attracted notice at an early period, having been known to and described by Dioscorides. It is one of the finest shrubs of southern Europe, and is also found in luxuriant growth on the limestone rocks about Killarney, in Ireland, whither it was probably conveyed from Spain. Although not a native of England, it flourishes remarkably well in the south parts of Hampshire and elsewhere, bearing both flowers and fruit during the autumn; the bark and leaves are astringent. In Corsica, a wine is prepared from the berries, but it is said to have narcotic properties.

Rhododendron ferrugineum (5) is a striking ornament of Alpine regions, advancing to the extreme limits of woody vegetation; the bright red flowers of the Rose des Alpes frequently delight the mountain traveller when he meets with it on his solitary path, or it is brought to him as a humble offering by the peasants of the country. The wood furnishes the shepherds of the lofty summer pastures with their only fuel. *R. hirsutum* is another Alpine species. *R. arboreum* (6) is a splendid tree of forty feet in height, growing on the southern districts of the Himalayas, between 5000 and 8000 feet of elevation; it sometimes occurs in a broad belt on the slope of the mountain, and in March and April, when each branch is terminated with a cluster of the crimson flowers, it has a very magnificent aspect; the wood is much used by the natives, and a kind of jelly is made from the flowers. *R. dauricum* is an early flowering shrub of English gardens, introduced about seventy years ago from Eastern Asia, where it spread over the Mongolian Deserts, and abounds around the Lake Baikal, and in the fir-woods on the shores of the rivers. *R. ponticum* is supposed to have yielded the honey which Xenophon describes to have been so injurious to the Greeks in the celebrated retreat of the Ten Thousand, causing them to fall down after eating it, as if poisoned. *R. lapponicum* belongs to the Northern regions, and extends to the plains of the Arctic zone.

Kalmia latifolia (7) inhabits rocks and sterile ground in North America; the flowers exude a deleterious kind of honey, and the leaves are poisonous to animals, but the Indians make use of the hard wood for various purposes; from the roots also they make dishes and other small articles. The different species of *Azalea* from Asia and North America afford hardy and ornamental shrubs for gardens. On the mountains of the tropics, *Befaria* takes the place of *Rhododendron*, and covers the rocky slopes to the height of 10,000 feet. Humboldt discovered *B. ledifolia* on the Silla de Caraccas at 6000 feet; some species belong to the lower hills. The bright red berries of *Gualteria procumbens* contain an aromatic oil used medicinally in North America. *G. hispida*, the Wax-cluster of Tasmania, has white berries of an agreeable flavour. *Andromeda* is a genus belonging to Alpine regions and bogs; *A. hypnoides* extends over wide plains in Lapland. *Ledum* and others inhabit similar localities in North America.

This Tribe is dispersed in the greatest abundance in South Africa and North America; in Europe it is common, but limited to a few species; in South America it is found both within and beyond the Tropics; it abounds less in Northern Asia and India, and is almost unknown in Australia. When found in Tropical regions, it exists only on mountains. *Erica* covers vast tracts at the Cape of Good Hope, to which by far the greater number of species especially belong. *Befaria* is peculiar to the mountains of South America.

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Belvisiaceae
The Napoleona Tribe

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BELVISIACEÆ.

THE NAPOLEONA TRIBE.

A FEW shrubs of small size, having a soft white wood. The leaves are evergreen, alternate, leathery, with thick channelled stalks, entirely destitute of stipules. The flowers grow from the stem and branches, at the base of the leaf-stalk, surrounded at their base by a few round imbricated scales. The calyx is a thick leathery cup, divided into five ovate segments at the top, not folded over each other in the bud. The corolla is composed of three parts or rings; the outer circle is of one petal, five-lobed, and having in each division seven strong ribs, which in the bud are folded closely together, the thin membranous portion of the petal lying wrinkled between them. As the flower expands, the ribs still give it a plaited appearance. The next ring is a row of slender curled fine-pointed threads. The third is of a cup-shape, the top notched and rolled inwards. The stamens are twenty, and form a circle within the cup, surrounding the short solid style; the filaments are wide at their base and narrow at the top; the anthers are oblong, two-celled, attached to the top of the filaments. The ovary lies embedded in the mass formed by the base of the corolla, stamens, and disk; it has five cells, in each of which two ovules are suspended from the top of the central axis. The upper part of the style is five-angled, and is terminated by a flat stigma, also having five angles, at the points of which are small glands or pores. The fruit is a soft spherical berry, surmounted by the calyx, with a tough rind and mucilaginous pulp. The seeds are large, kidney-shaped, and contain no albumen.

This Tribe has most affinity with Rhizophoraceæ, chiefly through Kandelia.

The rind of the fruit contains tannin.

The principal genus of this Tribe was named *Napoleona*, by Palisot de Beauvois, who discovered it in Oware, to the south of Benin, in Africa, 1807, when the great conqueror of France was in the ephemeral zenith of his glory. Desvaux subsequently named it *Belvisia*, in honour of its discoverer, and the tribe was thence called *Belvisiaceæ*. *Napoleona imperialis* (1) is a shrub of stately growth, about eight feet in height; the large glossy leaves render it very ornamental even in the winter, but it is at present rarely to be seen in conservatories. The flower and fruit are of remarkable structure; in the latter may be traced a resemblance to that of *Careya* and *Barringtonia*, and still more to the

1. *Napoleona imperialis*.

Oware and Senegambin.

1A Calyx. 1B Section of Flower.

1C Stamen magnified. 1D Cup and Stigma.

1E Cross Section of Ovary.

1F Section of Ovary. 1G Seed.

A A

BELVISIACEÆ.

Pomegranate amongst Myrtaceæ. A singular formation in the wood is found to be nearly similar to that of young plants of *Rhizophora*, both containing slender bristle-like tubes, which are perceptible on breaking it crosswise. The strong ribs and plaiting of the corolla is also very similar to that of the calyx of *Bruguiera gymnorhiza* in the Mangrove tribe. But although several points of resemblance to other plants are discernible, yet the two remarkable genera of which this tribe is composed are clearly distinguished from every known order. Very little has been ascertained respecting their properties or uses, but the pulpy fruit of *Napoleona* is said to be eatable, and the Africans prepare a kind of ink from the rind, which is full of tannin. In the unexplored regions of Africa, it is probable that other species may be discovered. *N. imperialis* has been found in Senegambia by the French traveller and naturalist, Heudelot.

Asteranthus, the other genus of this tribe, is an evergreen shrub, the leaves two or three inches in length, smooth and sharp-pointed. The calyx has usually the lobes ending in a glandular hair. The flower is from two or three inches in diameter, the edge of the petal notched and hairy, strongly ribbed and veined. The conical style is terminated by a six-rayed stigma. The flowers are solitary, without bracts, and are seated in the axils of the leaves, like those of *Napoleona*.

This limited Tribe belongs entirely to Tropical Africa.

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Amelanchier canadensis
The Mayhaw Tree

MYRSINACEÆ.

THE MYRSINE TRIBE.

TREES and shrubs; the leaves are undivided, entire at the edges, or serrated, leathery, smooth, without stipules; some are undershrubs, with opposite or ternate leaves. The flowers are small, and grow in umbels, or panicles, or from the base of the leaf-stalks; seldom from the ends of the branches. The calyx is four or five-lobed, persistent. The corolla is of one petal, attached to the base of the ovary, divided at the top into four or five equal segments, often marked with sunken dots or glandular lines. Sometimes the stamens and pistils are in separate flowers; the stamens are four or five, opposite to the segments of the corolla, and inserted into its base; the filaments are distinct, rarely connected, sometimes wanting; occasionally five imperfect petal-like filaments are alternate with the others; the anthers are attached to the filaments by their base, and open by two longitudinal cells. The ovary is free, or partially adherent to the calyx, with a single cell, containing many ovules. The style is single, often very short, the stigma undivided or lobed. The fruit is fleshy, containing one or many seeds. The seeds are angular or roundish, with a hollow scar and a single covering; they contain abundant horny albumen.

This Tribe is allied to Sapotaceæ, chiefly through *Jacquinia*; and to the Mangrove tribe by *Ægiceras*.

Slightly pungent fruit and astringent bark are the only known properties of these plants.

Myrsine is a genus of evergreen shrubs dispersed over a wide range of latitude in Africa, although the whole tribe is very limited in its geographical boundaries. *M. africana* grows at the Cape of Good Hope, in Abyssinia, and in the Azores, at the northern limit of these plants. *M. retusa* (1) is a shrub about two feet high, with small flowers, scarcely visible amongst the leaves, but beautifully marked with

1. *Myrsine retusa*, *Small-leaved Myrsine*.

Azores.

1A Flower. 1B Stamen. 1C Pistil.

2. *Suttonia divaricata*, *Straggling Suttonia*.
Lord Auckland's Isle.

2A Flower. 2B Variety of Pistil.

2C Section of Fruit.

3. *Ardisia crenulata*, *Crenulate-leaved Ardisia*.

West Indies.

3A Flower. 3B Section of Fruit.
3C Seed.

4. *Jacquinia aurantiaca*, *Orange-flowered Jacquinia*.
Sandwich Isles.

5. *Embelia robusta*.
Ceylon.

6A. Seed of *Mæsa argentea*.

MYRSINACEÆ.

red dots, as seen in the microscope. The berries of *M. bifaria* are said to have medicinal properties; the plant is sometimes called *Box* by European travellers on the Himalaya, where it grows with an aspect similar to that of our English garden plant so called. *M. semiserrata* and *M. acuminata* ascend as high as Mussooree, above all other species of the tribe in that mountain region, excepting *Mæsa argentea* (6) and *M. indica*. *Suttonia divaricata* (2) is remarkable as being the only shrub growing on plains on a level with the sea between 35° and 52° of S. lat. It is frequent in the woods which border the sources of rivers in the Bay of Islands in New Zealand; in Lord Auckland's Isle, in 50°, it becomes more woody and straggling, but is of pleasing aspect when the berries are ripe. This is one of the species of this tribe scattered over a considerable space of latitude, where the temperature is favourable, especially in islands. *Ardisia* is an ornamental evergreen genus, belonging both to the East and West, in hot latitudes. *A. solanacea* embellishes the moist valleys of Coromandel with its fine red and white flowers, with large erect anthers, and profuse abundance of bright red berries, which have the property of staining paper brown. *A. punctata* and *A. lentiginosa* are natives of China. *A. excelsa*, the tallest species, grows in Madeira, and is a tree thirty feet high, the leaves shaped like those of the Laurel. *A. crenulata* (3) attains about ten feet in its native country, but is not usually so large in English conservatories. The red berries remaining throughout the winter, render it a very desirable species for cultivation. *A. acuminata* is a native of Guiana. Jacquinia was named after Nicolas von Jacquin, a celebrated Dutch botanist, who resided and studied many years at Vienna, where he published several excellent works on plants, with coloured plates, chiefly from specimens in the botanic gardens of Schoenbrunn and Vienna, founded by the wise Maria Theresa. *J. aurantiaca* (4) is remarkable for its colour. *J. armillaris* is a finer species, with white flowers, the branches of which are woven into garlands in America. *Embelia robusta* (5), *embilla* in Ceylon, is one of the largest trees of the tribe, affording useful timber and valuable shade. The berries are said to be unwholesome. Theophrasta records the name of one who, 350 B.C., studied and wrote on the natural history of plants, in Lesbos and Athens. *T. Jussieui* combines the modern botanist and the ancient sage; it is a prickly evergreen shrub growing in St. Domingo, there named *le petit Coco*. The seeds are pounded and made into a kind of bread, much eaten by the natives. Clavija of South America has a pleasant fruit, and a root useful in medicine. The fruit of *Reptonia buxifolia*, the *Goorgoora* of Cabool, is sold in the bazaars, but not relished by Europeans; it is about the size of a cherry, and very succulent. *Ægiceras* is a singular genus, differing in the seed-vessel being a follicle, and the seeds destitute of albumen. It has the peculiar power of sending roots out of its seeds in moist air before reaching earth. Resinous glands have been discovered in the wood, flowers and fruit of several species.

This Tribe inhabits chiefly in the Indian Ocean. No species have been discovered in Asia further north than in latitude 40°, in Japan. In Africa, none are known to extend beyond the Tropic of Cancer, on the north. *Myrsine floridana* is the only species of North America, in latitude 30° north. None belong to Europe.

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SAPOTACEÆ.

THE SAPPODILLA TRIBE.

TREES and shrubs, nearly all tropical, of soft wood, often abounding in a milky glutinous juice. The leaves are alternate, or occasionally crowded into circles on the branches, without stipules, entire at the edges, leathery. The flowers proceed from the base of the leaf-stalks. The calyx is regular, divided into four or eight lobes, persistent. The corolla is composed of one petal attached to the base of the ovary, regular, deciduous; its divisions usually equal in number to those of the calyx, rarely more, imbricated in the bud, sometimes fleshy. The stamens arise from the corolla, are of definite number, distinct; those which bear fertile anthers of the same number as the divisions of the corolla and opposite them; the imperfect stamens alternate with them. The ovary is above the base of the calyx, with several cells containing one ovule each; the style is single, the stigma undivided, or sometimes lobed. The fruit is fleshy, with several one-seeded cells; the seeds are nuts, often with a bony shining case, having a long slender scar on the inner face; they sometimes contain albumen.

The Tribe is closely allied to Ebenaceæ; chiefly distinguished by soft wood, milky juice, and complete flowers.

Astringent bark and oily fruit are the principal properties.

Sapota is derived from the Mexican name *Zapotl*. *Achras*, a Greek name for a wild pear, is a genus of several large trees bearing eatable fruit. *A. Sapota* (1) grows to the height of twenty feet before branching, abounding in white tenacious juice; the fruit varies in size and shape, brown when ripe, the pulpy flesh yellow; like the Medlar, it is sweet in decay; two seeds only ripen, and are of pleasant scent and taste. It is much eaten by natives, and is also the favourite food of turkeys and other birds. Cumana and Margaretta Isle are the best stations for it. The Humming-bird forms its nest upon the leafy branches. The bark is used as a remedy for fever in Peru. *A. mammosa*, the Marmalade-tree of America, is a larger species; and the leaves being a foot long, and three inches wide, render it a valuable shade near dwellings. The cream-coloured flowers are succeeded by a

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| 1. <i>Achras Sapota</i> , <i>Sappodilla Plum</i> .
South America.
1A Corolla, opened.
1B Pistil. 1C Seed. | 3. <i>Mimusops Kauri</i> , Indian <i>Mimusops</i> .
Manilla and China. |
| 2. <i>Isonandra gutta</i> , <i>Gutta-percha Tree</i> .
Singapore and Borneo.
2A Flower. 2B Stamen. 2C Fruit. | 4. <i>Chrysophyllum Cainito</i> , <i>Star-Apple</i> .
West Indies.
4A Flower. 4B Ovary.
4C Section of Fruit. |

SAPOTACEÆ.

large fruit having the luscious flavour of quince marmalade. But the most universally important tree of this tribe is *Isonandra gutta* (2); it is a remarkable instance of a valuable article lying dormant for a long period after its discovery, as if there were an appointed time for all things to come forth for the service of man. Two centuries ago, Tradescant, the first collector of botanical specimens in England, described a substance in his museum exactly resembling Gutta Percha; but at that time many things were classed as curiosities without a thought of utility; besides, the machinery by which it is now rendered available was not then invented, nor did many of the uses to which it is now applied exist. It was therefore removed with the rest of the Tradescant treasures to Oxford, and remained unperceived by the eyes of wisdom and science. The enormous increase of the imports of Gutta Percha from Singapore, after its renewed discovery, is probably unequalled: from 230lbs. in 1844, to 1,700,000lbs. in 1848. The extensive forests of the trees in Singapore, Borneo, and the countless islands of those seas, yield the principal supply of this wonderful material, which, abounding in the *latex* vessels, exudes from all parts of the stem and branches, on making incisions. The young leaf-buds are generally covered with the white glutinous fluid. It rivals and in many points resembles Caoutchoue, differing chiefly in not being elastic, and in becoming extremely pliable at a temperature of 145° Fahrenheit. *Mimusops Kauki* (3) affords gum from the bark, and bears a sweetish fruit, eaten by the natives of India. From the aromatic flowers of *M. Elengi* a fragrant water is distilled. *Chrysophyllum* derives its name from the golden down which clothes the under surface of the leaves. *C. Caimito* (4) is a tall tree with slender, supple branches. The leaves, as well as fruit, are full of a milky juice, which is sweet and agreeable in the fruit when ripe. *C. microphyllum* is a beautiful species, with small leaves shining like gold and silver on the lower surface. *Bassia* yields from its fruit a thick white oily substance, like butter; one species is the Butter-tree described by Mungo Park as so useful to the inhabitants of the interior of Africa. *B. longifolia* is the *Illupic* of India, affording a valuable supply of oil for lamps. *B. latifolia* abounds still more in oil; a large supply has lately been imported to England with the intention of improving the manufacture of soap; the flowers are used in making arrack in India. The flowers of *Bumelia* grow in thick clusters on the stem; the wood is hard, and the astringent bark used in fevers. *Lucuma* and *Imbricaria* bear sweet subacid fruit.

This Tribe inhabits chiefly the Tropics of Asia, Africa, and America; a few species belong to the south of North America, and to the Cape of Good Hope.

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Eriobotrya
japonica

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EBENACEÆ.

THE EBONY TRIBE.

TREES and shrubs, with heavy, solid wood, and without milky juice. The leaves are alternate, without stipules, entire at the edges and leathery. The flowers grow at the base of the leaf-stalks; they are seldom complete, the stamens being imperfect in some, the pistil and ovary in others. The calyx has from three to seven divisions. The corolla is of one petal, attached to the base of the ovary, regularly divided into three to seven parts, deciduous, somewhat leathery, usually downy on the exterior, and smooth within. The stamens arise from the corolla, or from the base of the ovary, are of equal number with the segments of the corolla, and alternate with them, or are twice or four times as many; sometimes fixed in pairs at the base of the lobes of the corolla. The filaments are sometimes simple, sometimes double, both the divisions bearing anthers attached by their base, lanceolate, two-celled, gaping lengthwise, sometimes bearded. The ovary is without a disk, many-celled, each cell having one or two ovules, pendulous from the top. The style is divided, seldom simple; the stigmas divided or simple. The fruit is fleshy, round or oval; the seeds have a membranous covering, a few only ripen; they contain albumen.

This Tribe is allied to Sapotaceæ, but differs in the dense wood and watery juice. In some points of structure it has affinity with Oleaceæ.

Hard wood and eatable fruits are the principal characteristics of the trees.

Diospyros, from the Greek, the fruit of heaven, or pear of Jove, is a genus known to the ancients, and of considerable value in modern times in the species Ebony, *D. Ebenum*, which has been adopted as the name of the tribe. It is abundant in Madagascar, the Mauritius, and Ceylon, from whence large supplies are imported into Europe; the centre of the trunk, or heart-wood, is the most valuable portion, from its close texture, deep black colour, and capability of fine polish. *D. Ebenaster* yields likewise an excellent wood for ornamental purposes, occasion-

1. Diospyros <i>Embryopteris</i> , <i>Viscid-fruited</i> <i>Date-plum</i> . Bengal.	2B <i>Petal and Stamens</i> . 2C <i>Glands and imperfect Pistil</i> .
1A <i>Flower</i> . 1B <i>Calyx</i> . 1C <i>Section of Fruit</i> .	3. <i>Royena pubescens</i> , <i>Downy Royena</i> . Cape of Good Hope.
2. Diospyros <i>Lotus</i> , <i>European Date-plum</i> . Italy.	3A <i>Calyx and Fruit</i> . 3B <i>Calyx, Stamens, and Pistil</i> .
2A <i>Calyx and Pistil</i> .	4A. Diospyros <i>melanoxydon</i> . <i>Seed</i> . East Indies.

EBENACEÆ.

ally marked with white and brown lines. *D. embryopteris* (1) is also named *glutinosa*, from the very glutinous nature of the fruit, used in Bengal to protect the outside of boats from decay; it is a globular berry, with a yellow pulp, of astringent quality, but eaten by the natives in the valleys of the Circar mountains, where it grows; the wood is hard, and employed for various purposes. The fruit of several species is considered eatable when mature, although it is generally bitter before ripening; that of *D. Kaki* is preserved as a sweatmeat in China, and is sometimes sent to England. *D. Lotus* (2) bears a sweet and slightly astringent fruit, which was formerly supposed to be that eaten by the ancient inhabitants of the north of Africa, the Lotophagi, but that is since determined to be *Zizyphus Lotus*. *D. virginianum*, the American Date-plum, has a white brittle wood, with a dark brown bark, used medicinally in North America, the fruit is about the size, and has the same firm texture, as the Date. *D. discolor* is the Mabolo fruit of the Philippine Isles. *D. melanoxyton* of Coromandel yields a wood equal in quality to Ebony; and the fruit is esteemed by the natives, as is also that of *D. racemosa*, *tomentosa*, and others. *D. Roylei* is abundant in the Ghauts of Central India. *D. obovata* belongs to the West Indies. *Diospyros* belongs to the lowest zone of the Peak of Teneriffe, from the shore to the height of 2000 feet. It exists also in several species in Hong Kong. *Royena* was named by Linnæus in remembrance of Adrian von Royen, who, as well as his son David, was a professor of botany at Leyden. It is a genus nearly confined to the Cape of Good Hope. *R. pubescens* (3) is a shrub about three feet high, with a grey bark; the fruit, when ripe, is about an inch in diameter, the enlarged calyx remains reflexed from it. The rind of the fruit is leathery, the pulp of a fleshy nature. *Maba buxifolia* is a low shrub yielding well-flavoured eatable berries, relished by the natives of Tongatabou, one of the coral isles of Polynesia, in 20° of south latitude. The wood is dark-coloured and hard, available for durable purposes, as far as the size admits.

This Tribe chiefly belongs to the Tropics of India; a very few species extend northwards as far as Europe, in Italy and Switzerland.

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E.T. del.

Viburnum
The Olive Tribe

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O L E A C E Æ.

THE OLIVE TRIBE.

TREES and shrubs, with branches usually forked, and ending abruptly by a conspicuous leaf-bud. The leaves are opposite, simple, sometimes pinnated, as in the Ash. The flowers grow in racemes or panicles; the flower-stalks placed opposite each other with a single bract at the base. The flowers are either perfect, or have stamens and pistils on different flowers. The calyx is divided, persistent, below the ovary; the corolla is of one petal, four cleft at the top, occasionally of four petals connected in pairs by the intervention of the filaments of the stamens; sometimes the corolla is wanting. The stamens are generally two, in Tassarandra they are four, alternate, with the divisions of the corolla, or with the petals; the anthers are two-celled, opening longitudinally. The ovary is simple, without any disk, two-celled, the cells two-seeded: the style is simple, or wanting; the stigma bifid or undivided. The fruit is either a drupe, as in *Olea*; a berry, as in *Ligustrum*; a capsule, as in *Syringa*; or a winged samara, as in *Fraxinus*; often with only one perfect cell: the seeds have fleshy abundant albumen.

This tribe has, in many respects, affinity with the Jasmine tribe.

The chief character is the oil contained in the fleshy portion of the fruit instead of in the seed. *Olea europæa* (1), the most valuable plant of this tribe, has been highly esteemed in all ages and countries; in the earliest times, "the land of olive" was an expression of the most desirable abundance; to flourish like a green olive-tree was descriptive of the greatest vigour and prosperity; it has also been considered as a token and emblem of peace since the memorable day when the dove came back into the Ark—"and, lo! in her mouth was an olive-leaf." The use of oil was early known to the inhabitants of the earth, and its value was so great that it became a symbol of the highest gifts and qualities. The olive-tree attains a great age; some at Terni are said to have existed in the time of Pliny. Although Asia is its native country, it is now perfectly naturalized in different parts of the south of Europe, thriving best on calcareous steeps near the coast of the Mediterranean; on the Apennines, between Genoa and Spezia, the effect of the grey foliage, mingled with the bright green of the chesnut and the dark glossy leaves

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| 1. <i>Olea Europæa</i> , Olive-tree. South Europe. | 3. <i>Ligustrum vulgare</i> , Common Privet. Britain. |
| 1A Calyx and Pistil. 1B Flower. | 3A Flower, magnified. |
| 1C Stone of Fruit. | 3B Section of Fruit. |
| 2. <i>Syringa vulgaris</i> , Common Lilac. Persia. | 4. <i>Fraxinus pendula</i> , Drooping Ash. England. |
| 2A Calyx and Pistil. | 4A Flower, magnified. |
| 2B Flower, opened. 2C Capsule. | 4B Seed. |

OLEACEÆ.

of the fig, is extremely picturesque. The unripe fruit, when prepared in salt and water, is thought an agreeable condiment by Italians and Spaniards; oil is obtained by pressure from ripe fruit; the bark is bitter and astringent. *O. fragrans* is a low shrub with yellow flowers, which are odoriferous as well as the leaves, and much valued in China. *O. excelsa* is the largest tree that grows at 5000 feet on the Peak of Teneriffe. *Syringa*, the Lilac (2), now acclimatized in England, is become one of the most common and generally admired of shrubs, producing highly fragrant flowers in great abundance in May. In the time of Henry VIII., six lilacs were mentioned in the gardens of Nonsuch, as "trees which bear no fruit, but only a pleasant smell." In the marshy districts of Berri, in France, the peasants employ the flowers as a remedy against the intermittent fever which prevails there. *Ligustrum vulgare* (3) grows wild in the Isle of Wight and other parts of England, and is one of those few hardy shrubs which can endure the smoky atmosphere of cities, although its delicate flowers come forth only in a purer air. An ever-green variety forms remarkably good hedges. When of sufficient size, the wood is useful; the berries yield a green dye for wool. *L. lucidum* produces a kind of vegetable wax in China.

Fraxinus excelsior, the common Ash, is one of the most graceful as well as useful of British trees: in form and foliage easily distinguished among other forest trees. In the Isle of Wight it grows remarkably well, and is particularly beautiful when the leaves acquire their peculiar pale golden hues in autumn. *F. pendula* (4) was first discovered at Gamblingay, in Cambridgeshire. *F. rotundifolia* and other species yield from the bark the Manna known and used medicinally, the sweetness of which is a distinct principle called Mannite, differing considerably from Sugar. Various species belong to North America; the yellow Ash grows about the branches of the Mississippi, where the large stems are burnt out into canoes by the French fur-traders, and serve to convey their stores to New Orleans. The outer bark is eight inches thick; the inner bark of a yellow colour.

The plants of this Tribe are chiefly natives of Temperate climates, approaching towards the Tropics, but scarcely found beyond 65° of north latitude. *Fraxinus* abounds in North America and Europe; *Phyllirea* and *Syringa* belong to Asia and Europe; one species is a native of Nepal; a few species have been discovered in Australia.

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Jasminum nudicaule
The Jasmine Tree

W. & A. G. & Co. London

J A S M I N A C E Æ.

THE JASMINE TRIBE.

SHRUBS, often with a twining stem. The leaves are opposite or alternate, mostly compound, in threes, or pinnated with an odd leaflet, sometimes they are simple; the leaf-stalks are usually jointed. The flowers grow on opposite stalks, or in small spreading clusters; the calyx has from five to eight divisions or teeth, and is persistent. The corolla is of one petal, attached to the base of the ovary, tubular below, salver-shaped at top, and parted into from five to eight segments, which rest upon each other, and are twisted or valvate in the bud. The stamens are two, arising from the corolla, enclosed within its tube. The ovary is destitute of a disk, is two-celled, two-lobed, with from one to four ovules in each cell; the style is single, the stigma two-lobed; the fruit is either a berry or a capsule. The seeds have no albumen, or very little, their outer covering sometimes membranous.

This Tribe has affinity with the Olive tribe; the fruit indicates a connexion with Verbenaceæ.

A fragrant oil is contained in the flowers.

Jasminum, the type of this Tribe, derives its name from the Arabic, *Yasmyn*. *Jasminum officinale* (1) is the most common species cultivated in Europe, and a general favourite, from its delicious fragrance. Its original country is said to be Georgia and Circassia; it is also a native of the East Indies, grows plentifully in Malabar, and there produces its two-seeded fruit, which is not the case in this country. Gerard records that it was in general use for covering arbours before the close of the sixteenth century. A highly-scented essential oil is extracted from the flowers of this species, and also from those of *J. grandiflorum* and *J. odoratissimum*. *J. Sambac* is one of the most odoriferous, much esteemed by the Arabs and other Eastern nations; the first locality of its introduction to England is said to be the gardens of Hampton Court, where it grew towards the end of the seventeenth century, but was subsequently lost. A few shrubs flourished also in the garden of the Grand Duke of Tuscany, at Pisa, from whence fresh specimens were brought to this country early in the eighteenth century; two varieties of this

1. *Jasminum officinale*, Common Jasmine. Asia.

1A *Jasminum ligustrifolium*.

Flower, opened.

1B. Section of Ovary.

2. *Jasminum fruticans*, Yellow Jasmine.

South Europe.

3. *Nyctanthus arbor tristis*, Night-flowering
Nyctanthus.

East Indies.

3A Flower opened.

3B Fruit.

3C Seed.

3D Section.

4. *Jasminum hirsutum*, Hairy Jasmine.

East Indies.

5. *Jasminum gracile*, Slender Jasmine.

Norfolk Isle.

JASMINACEÆ.

species have double flowers, one corolla within the other, the innermost of all occasionally bearing stamens. *J. fruticans* (2) is one of the first species planted in England; its yellow flowers are not fragrant, but it is of a hardy nature, grows well in sheltered gardens, and bears a black berry. *J. gracile* (5) is one of the beautiful plants which flourish abundantly in the moist climate of Norfolk Isle, in 31° of south latitude. *J. paniculatum* and *J. undulatum* are climbing species of China, with white flowers. *J. azoricum* of Madeira has yellow flowers. *Nyctanthes* (3) from the Greek for *night-flower*, is an evergreen shrub, expanding its flowers only during the darkness of night, whence also the specific name of *arbor tristis*; it is not often to be seen in English gardens, but is very commonly cultivated throughout India, and grows wild on the lower range of the Himalaya, in several regions, as well as on the banks of the Irawaddy. In the morning, the fragile blossoms lie scattered on the ground, and are collected by the native women, and strung into wreaths, as necklaces, or garlands for the hair. The tubes of the corolla when dried yield an orange dye.

The plants of this Tribe are chiefly natives of the Tropics of India, abounding in all parts. One species of *Jasminum* has been found in South America, and three species of *Bolivaria*. A few belong to Africa and the neighbouring islands. New Holland possesses several; two extend into the southern regions of Europe.

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Passiflora

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STRYCHNACEÆ.

THE STRYCHNOS TRIBE.

TREES, shrubs, and herbaceous plants. The leaves are opposite, entire at the edges, usually having stipules which adhere to the leaf-stalks, or are combined into sheaths. The flowers are on branching stalks, or solitary. The calyx is below the ovary, four or five-parted; the corolla is regular or irregular, four or five or ten-parted. The stamens arise from the corolla, all placed on the same line. The ovary is above the calyx, two-celled, the style continuous with it: the stigma simple. The fruit is either a capsule with two cells, or a drupe with one or two-seeded stones, or a berry with the seeds immersed in pulp. The seeds are sometimes winged, they contain fleshy or cartilaginous albumen.

These plants have affinity with Apocynaceæ, but are distinguished by not having milky juice, nor a glandular stigma.

Strong venomous properties exist in the seeds.

The genus *Strychnos* includes several highly poisonous species, fatal to man and animals; *S. Tieute* (1) is remarkable for the virulent poison obtained from the bark of the root; it grows abundantly in Java, where it is called by the natives *Tjettek*. The seed of *S. nux vomica*, the *Koochla*, or Poison-nut of the East Indies, is one of the strongest known poisons; it has been found to contain two distinct principles, both acrid narcotics, and energetic in action. It is a small tree, bearing fruit with a brittle shell, full of a gelatinous pulp, in which the seeds are embedded. The pulp is eaten by birds without injury, but the seeds contain the poisonous juices; in small quantity they are used medicinally to cure the fever of the country, and the bites of venomous snakes, and are also employed in the distillation of spirits; their texture is so hard, they can only be broken by a rasp or file. *S. toxifera* is the principal ingredient of the celebrated Wourali poison of Guiana. Amongst the various febrifuges of Brazil is *S. pseudoquina*, said to equal the famous Peruvian bark; the whole plant, except the fruit, which is eatable, is intensely bitter and astringent. *S. pottatorum*, the clearing-nut of India, is a larger tree, and is of great value to the natives, who use the ripe seeds to purify the pond or river water, which they drink in preference to that of wells. They rub the inside of an unglazed earthen vessel

1. *Strychnos Tieute*, Poisonous *Strychnos*. Java.

1A Root.

1B Section of Fruit. 1C Seed.

2. *Fagraea littoralis*, Indian *Fagraea*. E. Indies.

3. *Spigelia marilandica*, Pink-root. N. America.

4A. *Strychnos ligustrina* flower.

4B Flower, opened.

4C Calyx and Pistil.

4D Section of Ovary.

4E Cross section of Ovary.

STRYCHNACEÆ.

with the seeds, which soon causes the impure particles of the water to separate and fall to the bottom, thus rendering it pure and wholesome. The pulpy fruit is eatable, though not thought agreeable by Europeans. The fruit of *S. spinosa* is eaten by pigs in Madagascar; that of *S. brachiata* affords food to deer in Peru. *Fagraea littoralis* (2) bears a small white flower, much resembling that of *Strychnos*; it is occasionally found growing in a parasitic manner upon other trees. *F. zeylanica* has been introduced into English conservatories, but is rarely seen. All the species are found in the isles of the Indian Archipelago, as well as in India. *Spigelia* was named by Linnæus in honour of Adrian Spigelius, a Fleming, afterwards professor at Padua, in the beginning of the 17th century. *S. marilandica* (3) is considered highly valuable for its medicinal properties, both in the root and leaves, in North America; it is sufficiently hardy to bear our climate in the open air, yet is not much known in gardens. *S. anthelmia* is one of the medicinal plants of the West Indies. *S. glabrata* is one of the poisonous plants of Brazil. The medicine called *Papeeta*, or St. Ignatius Beans, in India, is procured from the seeds of *Ignatia amara*. The leaves of *Potalia resinifera* yield a mucilaginous infusion, used as a lotion for the eyes in Brazil. *P. amara* forms a connecting link with the Gentians, possessing their bitter properties; it is at the same time acrid, like the Dog-bane tribe. *Logania* is a genus belonging to New Holland, the flowers small and white.

This Tribe inhabits chiefly the Tropics, a few species only are natives of New Holland, and North and South America.



Passiflora
The Yellow Tree

Printed by W. M. W. W.

APOCYNACEÆ.

THE DOG'S-BANE TRIBE.

TREES, shrubs, and a few herbaceous plants, usually with milky juice, often of a climbing habit. The leaves are opposite, sometimes alternate, or in circles on the stem, entire at the edges, without stipules, but having hairs or glands upon or between the leaf-stalks. The flowers generally grow from between the leaf-stalks. The calyx is five-parted; the corolla of one petal attached to the base of the ovary, often having scales at the throat, five-lobed, twisted or folded over in the bud. The stamens are five, placed on the corolla, alternate with its segments; the filaments of Apocynum are distinct; of Asclepias and others, combined; the grains of pollen are distinct in general, but in double masses in Asclepias; the ovaries are two, with two styles, and one stigma, contracted in the middle in Apocynum, five-cornered with glands at the angles in Asclepias. The fruit is a follicle, capsule, drupe, or berry, double or single; the seeds are numerous, usually hairy at the scar, with thin, fleshy, or cartilaginous albumen.

This Tribe has affinity with Gentianaceæ, but the form of the stigma is an obvious distinction, as well as the milky juice.

An acrid juice, sometimes containing caoutchouc, often poisonous, exists in these plants.

A great variety is found in this tribe; some species are remarkable for brilliant flowers; others, for the succulent leafless stalks; some are slender herbs, others have a large twisted stem coiled on the ground before rising upwards. In the time of Pliny, Apocynum was supposed to be poisonous to dogs, whence its name. *A. hypericifolium* (1) contains, like other species, an acrid juice; the glutinous stigma attracts flies, and the irritable stamens close on them. The stalks of *A. cannabinum* yield a strong fibre, used by the North American Indians as hemp, making from it nets, fishing-lines, and garments. *A. venetum* belongs to the Isles of the Adriatic. *Vinca* (2) flourishes well in shrubberies under the shade and dripping of trees; if not really indigenous, it has become naturalized in many parts of England; the juice of the plant contains gallic acid, but is not milky.

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| 1. <i>Apocynum hypericifolium</i> , <i>Hypericum-leaved</i>
<i>Dog's-bane.</i> North America. | 4. <i>Nerium Oleander</i> , <i>Common Oleander</i> .
South Europe and India. |
| 1A <i>Stamens, Pistil, and Glands.</i> | 4A <i>Stamen.</i> 4B <i>Pistil.</i> |
| 1B <i>Stamen.</i> 1C <i>Pistil.</i> | 5. <i>Allamanda cathartica.</i> Guiana. |
| 2. <i>Vinca major</i> , <i>Greater Periwinkle.</i> England. | 5A <i>Tube of Corolla, opened.</i> |
| 2A <i>Pistil.</i> 2B <i>Section of Ovary.</i> | 5B <i>Pistil.</i> 5C <i>Stamen.</i> |
| 2C <i>Section of Seed.</i> | 6. <i>Stapelia marginata.</i> Cape of Good Hope. |
| 3. <i>Cynanchum nigrum</i> , <i>Black Cynanchum.</i> | 7A. <i>Asclepias Syriaca.</i> Flower. |
| South Europe. | 7B <i>Stamen.</i> 7C <i>Seed-vessel.</i> |
| 3A <i>Seed-vessel.</i> 3B <i>Seed.</i> | 8A. <i>Glossonema Boryanum.</i> <i>Stamens and Pistil.</i> |

Cynanchum nigrum (3) has a singular aspect when the seed-vessels are formed, though the flowers are insignificant. Some of the most ornamental plants of this tribe have poisonous properties. *Nerium* (4), so beautiful in its native countries of the East, adorning the borders of streams, is considered very injurious; the natives of India have a superstitious dread of its baneful effects. In Spain, where it grows abundantly, the wood is seldom used, on account of its unwholesome juice; which is, however, not milky, as in most of the deleterious species. The simple leaves have a tough skin: after being soaked in water, the strong midrib may be easily drawn out by the stalk, and the pulp extracted; thus a leaf is clearly proved to be a bag. Among the more strongly poisonous plants is *Tanghinia venenifera* in Madagascar, where formerly criminals were commanded to eat of the fruit, and if they survived, were considered innocent; a rare occurrence, for one kernel would suffice to poison twenty persons. *Gonolobus macrophyllus* is used by the Indians of North America to poison their arrows. *Echites* affords brilliant flowers in our conservatories, and poison for the arrows of the Mandingoes in Africa. *Hasseltia* and others are also excessively acrid. *Plumiera* is a genus of fine flowers, but corrosive juices. *Allamanda* (5) was discovered in Guiana by Aublet, who saw and figured its large rough seed-vessel, which is now produced in this climate. *Asclepias* is the type of the division with stamens fixed round the style in a column; it belongs almost exclusively to North America, *A. curassavica* alone growing in South America. *A. syriaca* (7) is one of the sweet-scented and useful plants of Virginia; the French Canadians eat the young shoots, prepare sugar from the flowers, and collect the silky down of the seeds to stuff beds. The fleshy roots of *A. nivea* are used medicinally. *Stapelia*, named from Stapel, a Dutch commentator on Theophrastus 200 years ago, is a curious genus; the succulent stalks assume divers strange forms, and the flowers have a peculiar aspect, sometimes from their star-shape, tough substance, and hairy clothing appearing to be a link, outwardly at least, with some of the lower tribes of animals. Many of them have an extremely disagreeable odour: like other succulent plants, they exist in a dry soil; a few are said to afford food to the Hottentots. *Hoya carnosa* is a climbing plant from Asia, now seen in almost all conservatories with its honey-bearing waxen flowers and fleshy leaves. *H. campanulata* has elegant clusters of pale buff flowers. *Sarcostemma* is a singular leafless climber. *Caoutchouc* exists in the milky juice of several species: in *Collophora* and *Camarareria* of South America; in *Vatea* of Madagascar; a vast supply for trade is obtained from *Cynanchum* in Penang, and *Urecola* in Sumatra. *Alyxia* has an aromatic bark; many others afford medicine. Besides all these, there are several species yielding pleasant eatable fruit; that of *Carissa* is made into an excellent jelly. *Carpodium* is esteemed by the natives of Sierra Leone. *Willughbeia* bears a yellow berry in the axils of the old leaves; the fruit of *Cerbera* is agreeable. According to ancient tradition in Ceylon, *Tabernæmontana dichotoma* is the "forbidden fruit" of Paradise, and is now of nauseous flavour. *T. utilis* supplies a copious sweet milk. *Gymnema lactifera* is the cow-plant of the Cingalese. *Aspidosperma excelsum* has a remarkable fluted stem, serviceable for various purposes to the Indians of Guiana. *A. macrocarpa* has a seed-vessel six inches long. *Vallesia* grows in the Galapagos Isles.

The Tropics is the chief station of these plants; most abundant in Asia. *Asclepias* belongs to North America. Vast numbers of *Stapelia* grow in barren tracts of South Africa; one species alone is a native of Sicily. *Cynanchum* has a wide range between 59° of N. latitude and 32° of S. latitude. *Apocynum* extends northwards into Europe, *Vinea* into England.

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Rhizophoraceae
The Mangrove Tribe

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RHIZOPHORACEÆ.

THE MANGROVE TRIBE.

TREES and shrubs, the leaves of which are simple, opposite, sometimes dotted beneath, entire at the edges, or toothed, with convolute deciduous stipules between the leaf-stalks. The flowers grow at the ends of the branches, or at the base of the leaf-stalks; the calyx is surrounded at its base by a cup-shaped bract; the lobes are valvate in the bud, and are from four to twelve in number; occasionally all cohere at their points and edges. The petals arise from the calyx, are equal in number to its lobes, and alternate with them. The stamens grow from the calyx with the petals, and are either twice or thrice their number, or numerous; the filaments are distinct, the anthers erect. The ovary is two, three, or four-celled, each cell containing two or more ovules suspended from the top of the central angle. The fruit is closed, crowned by the calyx, one-celled and one-seeded. The seed is pendulous, contains no albumen. The radicle is very long, piercing the fruit when mature, and descending to the ground.

This singular Tribe has affinity in structure with some allies of the Myrtle Tribe, with Belvisiaceæ in its wood, and with several others, but it is clearly distinguished from all by the seed, growing in the fruit, with the single exception of *Ægiceras* in Myrsinacæ.

The bark is generally astringent.

Rhizophora derives its name from the Greek, in allusion to the roots which it bears profusely from the stem above ground. The Dutch named it *wilde Runboom* in their East Indian colonies; the French call it *Paletuvier*; the Spaniards, *Mangle*. Throughout the Tropics, on the banks of large rivers, and along the coasts of the ocean, are vast tracts of *Rhizophora Mangle* (1) bordering the land with a dense mass of spreading trees down to low-water mark, intercepting the rays of the sun, and causing an extremely unhealthy climate. The natives are able to pass by climbing dexterously through the interlacing roots and branches, without treading on the dangerous quagmire below. No one ventures to remain long in the malaria of such regions. The trees have a peculiarly remarkable appearance, standing on

1. <i>Rhizophora Mangle</i> . Mangrove.	2C Pistil.	2D Seed germinating.
Tropical Shores.	2E Section of Ovary.	2F Cross Section.
1A. <i>Rhizophora macrorhiza</i> . Anther magnified.	3A. <i>Carallia zeylanica</i> . Petal.	Ceylon.
2. <i>Kandelia Rheedii</i> .	4A. <i>Carallia lucida</i> . Berry.	
Malabar and the Ganges.	4B Section of Fruit.	4C Seed.
2A Flower open. 2B Stamen.		C C

RHIZOPHORACEÆ.

the verge of land and water, apparently propped up by the numerous roots which proceed from the stem and descend in an arched form to the ground or water. A very singular effect is also added by the long seed-vessels germinating on the branches. To the first Europeans who penetrated amongst the islands of the Caribbean Sea the spectacle must have been astonishing. The course of rivers is often interrupted by the encroaching swamps, and travellers are occasionally obliged to cut a passage for their boat; on the west shores of Borneo the landing at the mouth of some rivers is nearly impracticable from the accumulation of mud amongst the roots. When the radicle of the seed is developed and has pierced the capsule, the young plant is ready to take root immediately on reaching the mud, having the rare property of resisting salt water, and thus its growth is secured amidst circumstances unfavourable to any other class of flowering plants. By the time the tree has attained two or three feet in height, it begins to send forth branches, and then fresh roots from the stem; at about twelve feet it ceases to grow upwards, but spreads in branches. The roots at first are fragile, but become firm and of a grey colour. If their points receive any injury, they do not advance in length, though fresh branches sprout above, thus forming an entangled thicket, in which birds and insects innumerable find an abode: on the sea-coast, oysters also attach themselves to the branches which are submerged. The flowers have sometimes a slightly agreeable scent; the anthers soon fall off, the style is prolonged into the fruit, said to be eatable, and the juice capable of fermentation into wine. *Kandelia* (2) is derived from the native name in Malabar, where the trees abound, as well as on the shores of the Ganges: the specific name is in remembrance of Van Rheede, an early Dutch traveller in India. The wood serves for fuel, the bark is dried with ginger and used as long pepper. The petals are still more finely fringed than those of *Rhizophora*; this species has been lately discovered growing also in an estuary at Little Hong Kong. *Carallia*, the *Carallie* of the Telingas, is a genus of small evergreen trees extending beyond the usual tropical limits of this tribe, northwards in India. *C. lucida* (4) grows on the lower range of the Circar mountains, as well as in Kemaon and Silhet. *C. sinensis* has been found in a ravine of Mount Victoria in Hong Kong. The petals of this genus are not fringed as others, merely wrinkled or notched at the edges, and the fruit is a small round berry, the seeds of which do not germinate in the seed-vessel. The astringent bark of *Bruguiera gymnorhiza* of Java and the Moluccas is used for dyeing black. The wood of several species is described to be hard and durable. A *Bruguiera*, whose ten-lobed calyx resembles strips of red leather, is one of the remarkable plants which attract the attention of a colonist or settler on the muddy shores of the Brisbane river, Australia. Less than twenty years ago, the site of the now prosperous port of Adelaide was a Mangrove swamp.

This singular Tribe inhabits the shores of the Tropics; *Carallia* penetrates into the north of India.

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GENTIANACEÆ.

THE GENTIAN TRIBE.

HERBACEOUS plants, and a very few shrubs; generally smooth, occasionally of a twining habit. The leaves are opposite, rarely alternate; usually without leaf-stalks, sometimes having stalks widened at the base into a kind of sheath; entire at the edges, generally three-ribbed, without stipules. The flowers are at the ends of the branches, or at the base of the leaf-stalks, regular, very seldom irregular. The calyx is below the ovary, divided at the top, persistent. The corolla is of one petal attached to the base of the ovary, tubular below, divided above into from four to eight segments, equal to those of the calyx; the top of the tube, or the segments sometimes finely fringed; the corolla is sometimes prolonged into a spur at the base; in the bud state plaited or folded. The stamens are inserted on the corolla, alternate with its segments; some are occasionally imperfect. The ovary is composed of two carpels, one or two celled, many-seeded. The style is single, stigmas two; the seed-vessel is a capsule or a berry containing many seeds on the margins of the valves. The seeds are small, and contain soft fleshy albumen.

This Tribe has close affinity with Apocynaceæ, but is without milky juice, and the seed-vessel usually a capsule, not a follicle.

Intensely bitter juice exists in these plants.

Pliny relates that Gentius, king of Illyria, was the first to discover and appreciate the tonic properties of the genus, which was consequently named after him *Gentiana*. *G. lutea*, of the Alps, is one of the most powerfully bitter species; in some parts it covers wide tracts, but remains untouched by cattle; the root is large, affording an abundant supply of the bitter juice for medicinal purposes; formerly it was used instead of hops for beer. The root of *G. purpurea* is often two feet in length, and is sometimes substituted for that of *G. lutea*. *G. acaulis* (1)

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| 1. <i>Gentiana acaulis</i> , <i>Dwarf Gentian</i> . Europe.
1A <i>Flower opened</i> .
1B <i>Stamen</i> . 1C <i>Pistil</i> . | 4. <i>Villarsia nymphoides</i> , <i>Fringed Buckbean</i> .
Borders of the Thames. |
| 2. <i>Erythrea centaurium</i> , <i>Common Centaury</i> .
England.
2A <i>Flower opened</i> . 2B <i>Ovary and Pistil</i> . | 5. <i>Chironia decussata</i> . Cape of Good Hope. |
| 3. <i>Chlora perfoliata</i> , <i>Perfoliate Yellow-wort</i> .
Chalk, England. | 6. <i>Lisianthus Russellianus</i> . Mexico.
7. <i>Leianthes nigrescens</i> . Guatemala
8A. <i>Gentiana lutea</i> . Capsule.
9A. <i>Chironia baccifera</i> . Section of Ovary.
9B Section of Fruit.
9C Seed. 9D Section. |

is a lowly species, but its single flower is large and very beautiful. All these plants flourish best in their native situations, but if in a suitable soil and undisturbed, the stalkless Gentian forms a pleasing ornament of the garden in spring, when flowers are rare. *G. amarellu* and *G. campestris* grow on open heaths and fields; the top of the tube of the corolla is curiously bearded, but the colour is a dull purple, much less attractive than the usual intense blue. A traveller in Switzerland will often admire with surprise the noble specimens of tall blue Gentian growing on the Alpine pastures, or on the verge of glaciers. A lofty elevation is favourable to them generally. *G. imbricata* ascends to 8600 feet on the Alps; *G. nivalis* flourishes nearly on the limit of perpetual snow, unfolding its brilliant blue flowers amidst the wildest rocks and mountain torrents. One species is found on the Andes at 13,800 feet; another in Ceylon, between 6000 and 8000 feet above the sea. Cool and pure air is essential to this genus; it is therefore rare in hot countries, except on mountains; near the equator it is not found below 7800 feet on the Andes. *G. viscosa*, with yellow flowers, belongs to the Canaries, several others to Siberia. *G. prostrata* has an extensive range on the surface of the globe, inhabiting the Alps of Carinthia to the height of 9000 feet, the Altai Mountains in N. lat. 52°, the summits of the Rocky Mountains in North America at an elevation of 16,000 feet, growing on plains on the sea-level in Behring's Straits, on the eastern slopes of the Andes in S. lat. 35°, and at the Straits of Magellan. *G. aphylla*, bearing its erect yellow flowers with few or no leaves, adorns hollow trees in the woods which clothe the hills in the island of Martinique. *G. concinna* produces its delicate flowers, striped with red and white, in Lord Auckland's Isles in the far south. Erythrea (2) is a good example of our British Flora, exhibiting in a small type a very perfect representation of a peculiar characteristic; the twisting of the anthers after having discharged the pollen is as clearly shown in this delicate little flower as in the closely-allied genus *Chironia* (5). *Chlora* (3) is one of the remarkably neat plants that grow on the cliffs of Dover, and in a few other chalk districts; the elegant golden flowers expand during sunshine in July. The whole plant is bitter, and yields a yellow dye. *Villarsia nymphoides* (4) extends its long roots in the margins of the river Thames at Hampton and higher up; the stems are several feet in length, and are kept floating by means of the large heart-shaped leaves. A link with the water-lilies is observable in the leaves being rolled inwards when young; it is a native also of the Lake of Cashmere. *Exacum* is another British genus belonging likewise to India. The most valuable plant we possess in this tribe is the Bogbean *Menyanthes trifoliata*; the triple leaf is not to be mistaken for any other, and the exquisitely fringed flowers are exceedingly beautiful. The intensely bitter properties render it an extremely valuable remedy. *Lisianthus* was first imported from Jamaica towards the close of the last century. *L. Russellianus* (6) is of later introduction from Mexico. The root of *Frasera* affords a pure bitter tonic in North America, used like that of *Gentiana*. *Agathotes chirayta* is equally useful in the Himalayas. *Voyra* is an exception to the general character of these plants, having no leaves, only small brown scales, and a parasitical root.

This Tribe extends over almost every part of the world, from plains to the verge of perpetual snow; most abundant on the Alps and the Andes; less frequent in extreme north and south latitudes; rare in New Zealand, Tasmania, Greenland, Iceland, and the Arctic and Antarctic islands; unknown within the Polar regions.

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Ipomoea
de Trumpet

de Linotai

BIGNONIACEÆ.

THE TRUMPET-FLOWER TRIBE.

TREES, shrubs, and a few herbaceous plants; often twining or climbing. The leaves are opposite, very rarely alternate, compound or sometimes simple, without stipules, often with tendrils. The flowers are at the ends of the branches, in loose panicles. The calyx is entire or divided, sometimes a kind of sheath. The corolla is of one petal, attached to the base of the ovary, usually irregular; four or five-lobed. The stamens are five, of unequal length, one or three imperfect; the anthers are two-celled. The ovary is placed in a disk, two-celled, or partially four-celled, containing many seeds. The style is single, the stigma is formed of two plates. The capsule is two-valved, two-celled, often long and compressed, sometimes imperfectly four-celled. The two plates bearing the seeds meet in the axis and unite in *Bignonia*; in *Eccremocarpus* they adhere exclusively to the edges of the carpels. The seeds are transverse, compressed, winged, without albumen.

This Tribe is related to several others of similar appearance in inflorescence, but the winged seeds fixed to a plate distinguish it from all.

Bitter and mucilaginous properties exist in the bark.

Bignonia, the type of this Order, was named by Tournefort after his patron, the Abbé Bignon, librarian to Louis the Fourteenth. All the species are remarkable for beautiful flowers; some are large trees in the forests of Brazil, and yield excellent timber for ships; the *Ipeuma* furnishes the hardest wood in Brazil; another species, called the *Pao d'arco*, is found by the natives to be peculiarly well adapted for making bows. *B. capreolata* and others show very distinctly the curiously lobed form of the wood, sometimes having eight or sixteen divisions. *B. radicans* (1) is one of the most known in this country, in favourable situations remaining uninjured through the winter in the open air. It flourishes still more vigorously in Germany, and may be frequently seen there covering the walls of courts or gardens. *B. echinata* has a prickly capsule; the branches are

1. *Bignonia radicans*, *Trumpet-Flower*.

North America.

1A *Ovary and Pistil*.

1B *Winged Seed*.

2. *Eccremocarpus scaber*, *Rough Eccremocarpus*.

Chile.

2A *Section of Ovary*.

2B *Cross Section*.

2C *Seed*.

3. *Catalpa syringifolia*, *Common Catalpa*.

North America.

3A *Calyx and Pistil*.

3B *Stamens and Pistil*.

4. *Jacaranda mimosifolia*, *Mimosa-leaved Jacaranda*.

Brazil.

4A *Calyx and Pistil*.

4B *Flower opened*.

used medicinally. The leaves of *B. chica* yield when boiled a red starchy substance called *chica*, with which the South American Indians stain their bodies; it is also employed to give an orange-red hue to cotton. The tough and supple young branches of *B. cherere* are woven into a kind of wicker-work. The bark of *B. leucoxyton* is considered a valuable antidote to the poisonous Manchinel tree, *Ilippomane Mancinella* among Euphorbiaceæ. *B. multijuga* of the Silhet mountains, in India, bears a slender flat pod fourteen inches long, containing numerous winged membranaceous delicate seeds. *B. xylocarpa* has a tuberculated seed-vessel three feet long, as large as a walking-stick; a very remarkable appearance have these pods hanging in abundance from the trees on the Malabar Ghauts.

Eccecmocarpus, named from its pendent seed, is a very elegant genus; *E. scaber* (2) is now become a frequent inhabitant of our gardens, climbing over trellis-work or walls in a southern position, and is of extremely elegant growth. *Catalpa*, the Indian name in North America, is one of the most beautiful of the flowering trees introduced to Europe. The leaves of *C. syringifolia* (3) come forth late in the season, but are large and of a bright green; when the numerous spikes of delicately coloured flowers appear towards the end of July, the graceful beauty of its aspect can scarcely be surpassed. The long seed-vessels are rarely produced in this country; in America, a decoction made from them is said to be a remedy for coughs. Although of so tender an appearance, these trees are able to endure the smoky atmosphere of large cities; one of the first seen here was planted by Lord Bacon in the gardens of Gray's Inn, London, and as well as one in Lincoln's Inn, blossoms freely in summer. *C. longissima* of the West Indies is a taller species, with oblong wavy leaves. *Jacaranda* (4) retains its Brazilian appellation; all the species have extremely graceful foliage, resembling that of ferns in general character; in our conservatories, they grow freely in foliage, but seldom bear flowers. *Tecoma* is a Mexican genus, growing also in Brazil and at the Cape of Good Hope; like others of this tribe, it has brilliant flowers, and contributes to the embellishment of the world. Some of the species have useful properties; *T. impetiginosa* contains a large portion of tannin, and its bitter mucilaginous bark is employed for medical baths and other purposes. The leaves have also valuable healing qualities. *Incarvillea* is indigenous to China and Japan, and also has been discovered on the Himalayas. *Amphicome arguta* grows in Kunawur; the seed-vessel is a slender pod, of nearly similar appearance to some of the cruciferous plants. *Trigonocarpus* belongs to the Burmese coast, *Schrebera* to the south of India, *Wightia* to Nepal. *Fieldia* is a native of New Holland.

The plants of this Tribe adorn the Tropical countries of both hemispheres; some extend to the north as far as Pennsylvania in North America; others southwards to the southern parts of Chile in South America. None belong to Europe.

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Polemoniaceae.
The Polemoniaceae.

H. & C. 1840

POLEMONIACEÆ.

THE POLEMONIUM TRIBE.

HERBACEOUS plants, some of which are climbing. The leaves are opposite, occasionally alternate, compound, or simple. The flowers are generally in panicles, seldom solitary; the calyx is usually below the ovary, five-parted at the top, sometimes irregular, persistent. The corolla is regular, or nearly so, five-lobed. The stamens are five, inserted into the middle of the tube of the corolla, alternately with its segments; the pollen of the anthers is mostly blue. The ovary is above the calyx, three-celled, with few or many ovules; the style is simple, the stigma trifid. The capsule has three cells and three valves, which separate from the three-cornered central axis. The seeds are angular or oval, containing horny albumen; sometimes winged; often enveloped in a viscid substance full of entangled spiral threads.

This Tribe is connected with Convolvulacæ by Cobæa: it has also affinity with Gentianacæ, but is distinguished by the three-celled ovary.

These plants are mucilaginous and bitter.

Polemonium was known to the ancients, and is said by Pliny to have derived its name from the circumstance of two kings disputing who had the honour of discovering its value. Whatever may have been the supposed efficacy formerly, it is now classed among the useless plants, although *Polemonium cæruleum* (1) is one of the prettiest of our native flowers. It grows chiefly in the north of England and south of Scotland; at Malham and Gordale, in Yorkshire, it is abundant, often as much as two feet high; in cottage gardens it is a common ornament, generally known by the name of Greek Valerian, or Jacob's Ladder; it has been found also on the Himalayas. *P. reptans* is a creeping species of North America; *P. mexicanum* belongs to Mexico. *P. gracile* reaches the northern limit of the tribe in Siberia, and it is also known in Japan. *Gilia* is a genus named after a Spanish botanist, introduced of late years from California and Chile. The leaves of all the species are extremely slender, and the flowers very delicate. *G. tricolor* (2) was first brought to England twenty years ago, and is now an established favourite in the

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| 1. <i>Polemonium cæruleum</i> , <i>Greek Valerian</i> . | |
| | England. |
| 1A <i>Stamen</i> . | 1B <i>Capsule</i> . |
| 1C <i>Section of Capsule</i> . | 1D <i>Seed</i> . |
| 2. <i>Gilia tricolor</i> , <i>Threc-coloured Gilia</i> . | |
| | California. |

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| 3. <i>Phlox Drummondii</i> , <i>Drummond's Phlox</i> . | Texas. |
| 4. <i>Cobæa scandens</i> , <i>Climbing Cobæa</i> . | Mexico. |
| 4A <i>Stamen</i> . | |
| 5A. <i>Pistil of Collomia gracilis</i> . | |
| 5B. <i>Section of Ovary</i> . | |

POLEMONIACEÆ.

garden. Phlox being derived from the Greek signifying *flame*, was probably at first applied to a different plant: the species now so called are natives of North America; they are of hardy nature and produce their bright flowers of various shades of purple late in autumn, when red or yellow flowers are more prevalent; they are consequently a pleasing addition to the flower border, and help to maintain the due harmony of colour. *P. paniculata* and its white variety are old inhabitants of our gardens, well known formerly as *Lychnidea*. At the base of the slender curved tube is a store of honey, which bees extract, biting a hole in the tube. Several other species have been imported lately from North America, and though of more lowly growth, bear panicles of beautiful bright flowers of various shades of red and purple. This genus extends to Japan. *Cobæa* was named by Cavanilles in honour of Barnadez Cobo, a Spanish naturalist and author in the middle of the seventeenth century. It is an exception to the usual character of the tribe, being of a climbing habit, and possessing extraordinary power of growth in length of branches; in the shelter of a conservatory, it has been observed to attain 200 feet in the course of the summer. The number of pores in a square inch of the under surface of the leaf is 20,000; the capacity for development in plants seems in some degree to be connected with the number of pores. Mistletoe has only 200 pores in the square inch, and never attains to any great length. Rhubarb has 40,000, and expands its leaf and stalk to an immense size. *Cyanathus* belongs entirely to lofty parts of the Himalaya. *Collomia gracilis* (5), an extremely viscid plant, is a native of North America, now frequent in English gardens. *Leptosiphon*, so named from the exceedingly slender tube of the corolla, is a late importation from California, in which country several other genera of this tribe exist.

These herbaceous plants are most abundant in the Temperate latitudes of North and South America, more particularly in the North-west regions. A few only are natives of Europe and Asia. In the Tropics they are unknown.

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Convolvulus
The Bind-weed Tribe





CONVOLVULACEÆ.

THE BIND-WEED TRIBE.



SHRUBS and herbaceous plants, usually twining, and containing milky juice; the stalk and leaves are smooth, or simply downy; a few only are erect shrubs, and a few are leafless climbing parasites. The leaves are undivided, or lobed, seldom pinnatifid, and are without stipules. The flowers grow at the ends of the branches, or from the base of the leaf-stalks, or in dense clusters; the flower-stalks have usually two bracts, which enlarge after flowering. The calyx has five divisions, often unequal, persistent. The corolla is of one petal, attached to the base of the ovary, regular, and deciduous; the limb is five-lobed and plaited. The stamens are five, inserted into the base of the corolla, alternate with its segments. The ovary has from two to four cells, seldom only one, few-seeded. The style is single, usually parted at the top, sometimes with as many divisions as those of the ovary, and arising from their base. The stigmas are obtuse or acute. Around the base of the ovary is an annular disk. The capsule has from one to four cells, and is dry or succulent. The seeds have a small quantity of mucilaginous or fleshy albumen.

This Tribe has affinity with Boraginaceæ and Polemoniaceæ.

An acrid milky juice exists in these plants.

Convolvulus is a genus of very beautiful, though ephemeral flowers; it contains also the useful *Batatas* of the East and West Indies, and the medicinal gum-resin Scammony of Arabia. *C. sepium* (1) is a graceful ornament of our hedges; the flowers, as usual in this tribe, wither after a few hours, but in cloudy weather remain open till towards evening, though they generally close before rain. The calyx being protected and shaded from any outward influence by the two large bracts is exceedingly pure and transparent in texture, affording in the microscope an excellent view of the circulation of juices in the cells. The root is said to possess properties equal to Scammony. *C. americana* (2) is a corresponding species in the hedges of America, and scarcely differs except in the bright pink colour of the

1. <i>Convolvulus sepium</i> , Great Hedge Bindweed. England.	5A Ovary and Pistil.	5B Stamen.
2. <i>Convolvulus Americana</i> , American Bindweed. America.	5C Capsule.	5D Top of Capsule.
3. <i>Convolvulus Soldanella</i> , Sea-shore Bindweed. Coast, England.	5E Cell with two Seeds.	5F Section.
4. <i>Ipomea purpurea</i> , Major Convolvulus. America.	6. <i>Ipomea quamoclit</i> , Fine-leaved <i>Ipomea</i> . East Indies.	
5. <i>Convolvulus tricolor</i> , Minor Convolvulus. South Europe.	7. <i>Cuscuta epithymum</i> , Lesser Dodder.	
	8A. <i>Cuscuta verrucosa</i> . Ovary and Calyx.	
	8B Fruit.	8C Section of Ovary.
	9A. <i>Cuscuta Europæa</i> . Flower opened.	

CONVOLVULACEÆ.

flower. *C. Soldanella* (3) is one of the creeping-rooted plants which bind the sand of our coast in Essex and elsewhere, and is one of the three British plants existing in the Galapagos Isles. The leaves are small and tough, as is common in such situations; but the flowers are fragile, expand in the morning, and are of short duration. These species, and a few others, have lately been named *Calystegia*, on account of the bracts. *Ipomea purpurea* (4) is one of the general summer favourites in gardens, exhibiting daily an interesting variety of colours; the deep blue predominating whilst the plant is in full vigour, gradually fading with its strength and the decline of temperature, the last flowers being generally pink. This suggests two ideas—whether the development of blue depend on the power of the plant to acquire carbon, or on the state of light in the atmosphere. *C. tricolor* (5) has been long admired as a flower of pleasing lively aspect. *C. arvensis*, of our waysides, is found also in Madeira. *Ipomea quamoclit* (6) is one of the few examples of a finely-divided leaf in this order; it was introduced into our conservatories early in the seventeenth century, from the East Indies; the West Indies also includes it in its flora. A traveller and botanist, now in St. Domingo, mentions it as adorning a grave with its brilliant scarlet flowers. It has likewise been found entwining round *Euphorbia nereifolia* in South China. *I. tuberosa*, the arbour vine of Jamaica, extends its stems to a very considerable length. *I. pes-capræ* stretches runners 200 feet along the sandy beach of Panama. The root of *I. pandurata*, is used as Jalap in the United States; but *I. Jalapa*, from Xalapa, in Mexico, affords the chief supply of that medicinal resinous drug. *I. Turpethum*, of the East Indies, Malay Isles, New Holland, and the Isles of the Pacific, affords a valuable medicine. The leaves of *I. maritima* are used for fomentation in Brazil, and several other Tropical species possess valuable properties. *Pharbitis carulea* yields medicine from its seeds; *P. cathartica* from the root. *Piptostegia* is a medicinal genus of Brazil. The Mexican poison Guaco is said to be a kind of *Convolvulus*.

Cuscuta forms the type of the parasitical leafless section of this order; it resembles mistletoe in the manner of attaching itself to other plants, the suckers penetrating as far as the first wood, and never farther; it, however, differs in its early growth, commencing by rooting in the earth, and only afterwards becoming detached, and deriving its sole nourishment from the plant to which it clings by means of the small suckers on its stalk. *C. epithymum* (7) is frequent on heaths, entwining its thread-like stems around furze and other plants, twisting in close coils, then branching off and bearing clusters of delicate and beautifully shaped flowers. *C. europea* is less common, and is chiefly found on thistles, nettles, and flax. *C. epilinum*, of Germany, has of late years been observed on flax in this country, and was probably introduced with that seed. In Bohemia, *C. monogyna* is often clinging over willows and poplars. A gigantic species in Afghanistan covers willows thirty feet high. *C. racemosa* is used medicinally in Brazil; the fresh juice for hoarseness, the dried powder for healing wounds.

This Tribe is abundant in the Tropics, found in all Temperate regions, rare in cold climates, and unknown in the coldest. *Cuscuta* is less frequent in Tropical countries, where its place is filled by *Cassytha* among the Laurel tribe.

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Boraginaceae

The Borage Tribe

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BORAGINACEÆ.

THE BORAGE TRIBE.

TREES, shrubs, and herbaceous plants, with round stems. The leaves are alternate, simple, often covered with rough hairs growing out of a hard base; without stipules. The flowers grow on one-sided spikes, or racemes, or panicles, sometimes solitary from the base of the leaf-stalk. The calyx has four or five divisions, and is persistent. The corolla is of one petal attached to the base of the ovary, tubular, the upper part divided into as many segments as the calyx. The stamens are inserted on the corolla, are equal in number with the segments, and alternate with them. The ovary is four-parted, and four-seeded; or two-parted, and four-celled. The style is simple, arising from the base of the lobes of the ovary in *Borago* and others, terminal in *Heliotropium* and *Tournefortia*; the stigma is simple or bifid. The seeds distinct, four or two, separable from their covering, destitute of albumen. Those of *Tournefortia* are connected in a berry, and contain a small portion of albumen.

This Tribe is closely allied to the Nettle tribe, but has a regular corolla, a round not a square stem, and rough leaves without resinous dots.

These plants contain mucilaginous cooling properties.

Borago was known to Pliny as a cheering addition to wine; the flowers of *B. officinalis* (1) were long after his time used as an ingredient in a cooling, refreshing beverage. It has a tapering mucilaginous root, and large succulent stalks, which, as well as the leaves, are thickly beset with sharp bristles. Like all the plants of this tribe, the flower-stalk is incurved until the buds open, and the petals of this genus and many others are pink in the bud, and only acquire their bright azure hue when fully expanded. This is one of the curious facts respecting the colouring of flowers requiring the combined study of chemist and botanist. *B. orientalis* is a native of Turkey; *B. crassifolia* of Persia. *Cerinthe* (2) is common in France, and there called *Melinet*; in England, *Honey-wort*, from the store it offers to bees. In Italy and Sicily it grows plentifully. *Myosotis* (†) is

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| 1. <i>Borago officinalis</i> , <i>Common Borage</i> . | 4. <i>Myosotis palustris</i> , <i>Forget-me-not</i> . |
| 1A <i>Calyx</i> . 1B <i>Petal</i> . England. | Streams, England. |
| 1C <i>Stamen</i> . 1D <i>Anther</i> . | |
| 2. <i>Cerinthe major</i> , <i>Great Honey-wort</i> . | 5A. <i>Pistil of Symphytum</i> . |
| South of France. | 5B <i>Calyx with two Nuts</i> . |
| | 5C <i>Section of Seed</i> . |
| 3. <i>Tournefortia cymosa</i> , <i>Broad-leaved Tournefortia</i> . | 6A. <i>Fruit of Ehretia</i> . |
| Jamaica. | 6B <i>Section of Fruit</i> . |
| 3A <i>Flower</i> . | 6C <i>Seed</i> . 6D <i>Section</i> . |

one of the fairest ornaments of our rivulets, and has been named Forget-me-not here and in Germany, and considered an emblem of friendship. The pink buds change to a pure enamelled blue when open. Other species grow in woods, fields, and other dry situations. *M. versicolor* has yellow flowers mingled with the blue. *M. azorica*, brought by Mr. H. C. Watson from the Azores, is larger and of a deeper blue than any of our British species. Several other genera of this tribe belong to our flora. *Anchusa officinalis*, the Alkanet of old authors, was formerly supposed to possess cordial properties; it is chiefly to be seen near the sea in Northumberland. *Cynoglossum*, the Hound's-tongue of waste ground and roadsides, has a pungent, nauseous scent, and is esteemed narcotic. Amongst the flowers which come forth in May is *Pulmonaria*; the leaves, once supposed to be efficacious for coughs, are speckled with white. The fleshy mucilaginous roots of *Symphytum officinale* had also formerly a reputation for coughs; it grows generally in watery places, as in a hedge ditch; once plentiful near the Thames in the meadows of Twickenham. *S. tuberosa*, with its large white roots, belongs more to the south of Scotland than to England; it is found likewise in the woods and mountains of Germany. *Echium vulgare*, the Viper's-Bugloss, is clothed in all parts with prickly bristles arising from callous points; notwithstanding its roughness, it is a fine plant when the long spike of red buds, and the blue flowers, have attained the height of one or two feet. On some of the old walls in the north of France it grows much taller, and is very beautiful. *E. rubrum* yields a red substance, useful to dyers. *Lithospermum* is distinguished by the grey polished seeds, as hard as stones; it is sometimes called Grey Millet, from the appearance of the seeds. The bristles of this genus are minute and hard; the flowers blue or buff. *L. arvense*, growing principally in corn-fields, has white flowers. The red coating of the roots serves as a red dye, but that of *L. tinctoria* is more used. *Onosmodium* is one of the few species of N. America; *Trichodesma*, of Northern India, where it is used to cure the bite of snakes. *Tournefortia*, named by Linnæus after the great French botanist, belongs to the section of this tribe with the seeds united in a berry, preserving the two chief characters of rough leaves and incurved flower-stalks. *T. argentea* bears a pretty cluster of white berries. *T. cymosa* (3) has an extremely graceful aspect when the slender cymes of pale flowers hang from amidst the large leaves. Some species of *Ehretia* (6) bear eatable berries. The favourite flower of this section is the fragrant *Heliotrope*. *Heliotropium europæum* has been cultivated three hundred years. *H. peruvianum* was brought from Peru about a century ago; it has larger clusters of flowers, and is more highly scented. *H. europæum* is one of these plants found on the plains of India. *H. malabaricum* is peculiar to that country. *Anchusa*, *Myosotis*, and some other European genera, exist also in the Himalayas.

This Tribe inhabits chiefly the Temperate countries of the Northern Hemisphere, is very abundant in South Europe and Central Asia, diminishing northwards. *Heliotropium*, *Tournefortia*, and others, are principally Tropical trees or shrubs; a few only extending to South Europe, or in America as far as 45° north.

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HYDROPHYLLACEÆ.

THE WATER-LEAF TRIBE.

SMALL trees, bushes, and herbaceous plants, often hairy. The leaves are sometimes lobed, alternate, or the lower ones opposite. The flowers are on curling spikes, occasionally solitary and stalked, growing at the base of the leaf-stalks. The calyx is below the ovary, persistent, deeply five-cleft, sometimes having reflexed appendages between the lobes. The corolla is of one petal, placed below the ovary, regular in form, five-cleft at the top, partly campanulate. The stamens are five, alternate with the segments of the corolla, bent inwards in the bud; the anthers are two-celled, gaping longitudinally. The ovary is simple, two-celled, with two long styles and two stigmas. The fruit is a two-valved capsule, one or two-seeded; the seeds are netted on the exterior, and contain abundant cartilaginous albumen.

This Tribe has affinity with Boraginaceæ, but is distinguished by the terminal style, and the scales at the base of the corolla.

Slightly bitter properties exist in an unimportant degree in a few of these plants.

Hydrophyllum is named from the Greek for *water* and *leaf*, on account of the small portion of water contained in the folded leaf during the early growth of the plant. *Hydrophyllum virginicum* (1) inhabits marshes in North America, known and eaten as Shawanese salad in spring when the leaves are tender: introduced into the Chelsea Botanic Garden 1739. *H. canadense* is a nearly similar species, one of the many cures for the bite of snakes, and the noxious exhalations from *Rhus Toxicodendron*. *H. capitatum* grows in shady swamps and rocky groves bordering the rivulets of the Upper Missouri; a bushy plant two feet high, of a succulent nature, bearing white pellucid flowers. *Hydrolea spinosa* (2) abounds in the moist marshy places on the banks of rivers in the Island of Cayenne. The whole plant is downy; the bitter properties of the leaves render them useful as a healing remedy for wounds in the West Indies: it may be occasionally seen in our conservatories, but of slender size, not attaining the vigour of growth of its native country, where it forms bushes three feet in height. *H. zeylanica* extends

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| 1. <i>Hydrophyllum Virginicum</i> , <i>Virginian Water-leaf</i> . North America.
1A Flower, opened.
1B Ovary and Pistil.
1C Section of Ovary.
1D Cross section. | 2. <i>Hydrolea spinosa</i> , <i>Thorny Hydrolea</i> .
2A Calyx and Ovary. South America.
2B Stamen. 2C Section of Ovary.
3. <i>Eutoca viscida</i> , <i>Clammy Eutoca</i> . California.
4. <i>Nemophila phaceloides</i> , <i>Blue Nemophila</i> . North America.
1E Section of Seed. |
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HYDROPHYLLACEÆ.

over the plains of India from north to south. *Eutoca* is one of the numerous annual herbs with pretty blue flowers, discovered lately in North America, adding considerable embellishment to our gardens during the summer months. *E. viscidula* (3) is clothed with hairs, having minute viscid glands; the capsule contains many small seeds. *E. glandulosa* is a very beautiful species, with flowers of a deep blue, growing on the bituminous slate rocks of the hills bounding the Colorado river in the Upper Missouri country. *Nemophila phaceloides* (4) is also from the abundant store furnished by North America, and well suited to our climate; though of a very delicate texture, it remains in flower in the open border until late in autumn. Several other species have been lately imported. *Whitlavia* was discovered in California by Dr. Coulter, and named after a zealous patron of the Botanic Garden at Belfast. *W. grandiflora* nearly resembles *Eutoca* in general growth, but the flowers are more bell-shaped. *W. minor* differs chiefly in its less size. *Ellisia nyctalea* grows amidst the Marmot burrows of the prairies of the Upper Missouri. *Romanzovia* is one of the few examples of this tribe forming part of the scanty vegetation of Arctic America. *Codon* is a native of the Cape. *Nama* belongs to both the East and West Indies.

This Tribe is scattered over the northern and extreme southern provinces of North America, rare in other countries.

S O L A N A C E Æ.

THE POTATO TRIBE.

TREES, shrubs, and herbaceous plants. The leaves are alternate, undivided, or lobed ; some near the flowers are placed close together. The flowers are various, sometimes growing from the base of the leaf-stalk. The calyx is below the ovary, five-parted, seldom four, persistent. The corolla is of one petal, attached below the base of the ovary ; the top five-cleft, seldom four, regular. The stamens are inserted upon the corolla, as many as its segments, and alternate with them ; the anthers burst by pores, or lengthwise. The ovary is usually two-celled ; the style single, stigma simple. The seed-vessel is a capsule with two, four, five, or many cells ; or a berry ; the seeds are many, and contain fleshy albumen.

This Tribe is chiefly distinguished from Scrophulariaceæ by the flowers being regular, with as many stamens as lobes.

Narcotic and even poisonous properties exist in these plants, as well as wholesome food in some portions.

Solanum includes herbaceous weeds, some of which are noxious, spiny shrubs, and a very few trees ; the nutritious potato, the narcotic tobacco, and several medicinal species of value. *S. dulcamara* (1) is common throughout Europe ; it is sometimes called Bittersweet, the roots having first a bitter, then a sweet flavour. *S. nigrum* the other British species, with white flowers and black berries, is narcotic ; this is one of the three English plants found in the Galapagos Isles. The fruit of *S. Lycopersicum* (3) is more esteemed for food on the Continent than here, and is much cultivated in the south of Italy. *S. melongena*, the egg-plant, is grown both in the East and West Indies for the sake of the fruit, in shape and whiteness like an egg. In the north of Africa it is plentiful, and is eaten at Tangier by Moors and Europeans. *S. ethiopicum* supplies Chinese Mandarins with a delicate fruit the size of cherries. But the most important beyond compare is *S. tuberosum*, the Potato, first brought to Spain from the Andes, near Quito, early in the sixteenth century ; it was thence taken to Italy and Vienna. Sir

1. *Solanum dulcamara*, *Nightshade*. England.

1A *Calyx and Pistil.* 1B *Stamens.*

1C *Stamen.* 1D *Section of Seed.*

2. *Nicotiana tabacum*, *Tobacco*. N. America.

2A *Flower, opened.*

3. *Solanum Lycopersicum*, *Tomato*.

S. America.

4. *Juanulloa parasitica*, *Parasitic Juanulloa*.

Peru.

5. *Capsicum baccatum*. East and West Indies.

6. *Brugmansia sanguinea*, *Red Brugmansia*.

Peru.

- 7A. *Ovary of Petunia*

- 8A. *Capsule of Hyoscyamus.*

- 9A. *Fruit of Datura Stramonium.*

Walter Raleigh found it in Virginia, and introduced it to England and Ireland in 1586. Towards the end of the eighteenth century it became spread all over Europe, except the hot parts of Spain, and was accepted as a wholesome and valuable addition to the common food of man. Potatoes are not true roots, but tubers formed on underground branches, and contain leaf-buds arranged spirally around, capable of producing new plants. On the plains of Brazil grows *S. undulatum*, eight feet high, with thorny branches, large purple flowers, and fruit nine inches in diameter. *S. laciniatum* yields the eatable Kangaroo apple in Tasmania. *Nicotiana* (2) is better known by its name of Tobacco; derived from the Mexican place of its growth; for nearly three hundred years it has been the favourite narcotic in almost every country in the world, rivalled chiefly by the Betel of the East. It was first used by Sir Walter Raleigh, who thus provided the English with two popular plants out of this tribe. Immense quantities are cultivated in America, China, Japan, and other Eastern countries, as well as in Europe, wherever the temperature is sufficiently hot. The leaves being the part used, great care is taken to encourage their growth, rather than that of the flowers. *N. rustica*, with green flowers, is also grown in Germany. Among the powerful narcotic medicines afforded by this tribe, *Hyoscyamus niger* Henbane is the most ancient in fame; it grows on heaps of rubbish in various countries, usually in the neighbourhood of dwellings. The corolla is delicately veined; the capsule (8) opens with a lid, and contains numerous seeds. *Datura stramonium*, the Thorn Apple (9) of South America, is now indigenous here; the whole plant is poisonous, but some parts yield medicine. *Atropa Belladonna* affords a powerful medicine for the eyes; the black berries are poisonous. The Hottentots obtain a virulent poison for their arrows from *Acocanthera venenata*. *Juanullos* (4), named after two scientific botanists of Madrid, is an exception to the usual character of these plants, being parasitic in its growth. The seeds of *Capsicum baccatum* (5) when pounded are known as Cayenne Pepper. The pods are used in the West Indies as a pungent seasoning for food. Those of *C. annuum* are generally pickled in a green state. *Brugmansia sanguinea* (6) is one of the ornamental shrubs of Peru; the flowers of all the species are graceful in form; those of *B. arborea* are large and exceedingly fragrant. *Physalis alkekengi*, with its scarlet berry inclosed in the inflated membranous calyx, is thought pretty in our gardens; in Switzerland the fruit is commonly eaten. *Verbascum* is a genus of considerable beauty, native in Britain and throughout Europe; the leaves and stem are in some species so abundantly clothed with downy cotton that it is used for the wicks of lamps. *Petunia*, *Nierembergia* and *Salpiglossis* are all South American, now contributing countless varieties of gay flowers, hardy enough to flourish in European gardens.

This Tribe is found in nearly all countries except those within the Arctic and Antarctic Circles, most abundant in the Tropics, and chiefly in species of *Solanum*.



14 103

SCROPHULARIACEÆ.

THE FIG-WORT TRIBE.

SHRUBS and herbaceous plants. The leaves are opposite, alternate, or whorled. The flowers are on branching stalks, or grow from the base of the leaf-stalk; seldom in spikes. The flower-stalks are opposite or alternate, simple and one-flowered, or many-flowered on dichotomous branches. The calyx is below the ovary, persistent, four or five-lobed; the sepals more or less divided, sometimes quite distinct, often unequal, the side ones smaller. The corolla is of one petal, five-parted, or the two upper petals united at their points, making it four-parted; the tube is long or short; the upper part of the corolla flat, as in *Veronica*, or erect, nearly equally divided, or two-lipped, sometimes spurred at the base, folded over in the bud, the upper lobe innermost. The stamens are in a single row opposite the sepals, the upper one wanting or imperfect, the two lower often deficient; the anthers are two-celled, opening lengthwise. The ovary is two-celled, the style simple or rarely bifid. The fruit is a capsule, seldom a berry, two-celled, sometimes opening by pores or lids. The seeds are small, numerous, and contain albumen.

This Tribe has most affinity with *Solanaceæ*, but the corolla differs in not being plaited. *Buchnera* being leafless, and *Striga* parasitic, they form a link with *Orobanchaceæ*.

Acrid and bitter properties prevail in the leaves and roots of several species.

Scrophularia, Fig-wort, is dispersed over Europe, and extends to the Canaries, north of Africa, and the Levant. *S. aquatica* (1) is frequent in ditches, and is remarkable for the acute angles of the stem, and the small dark flowers. It has an unpleasant scent, and scarcely any animals will eat it. It is said, however, that the roots are wholesome, and that they afforded food to the starving garrison at the siege of Rochelle. *S. divaricata*, of the Altai mountains, has extremely

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| 1. <i>Scrophularia aquatica</i> , <i>Water Fig-wort</i> .
England. | 3. <i>Linaria vulgaris</i> , <i>Common Toad-flax</i> .
England. |
| 1A Flower opened. | 4. <i>Veronica chamaedrys</i> , <i>Germander Speedwell</i> .
England. |
| 1B Calyx and Ovary. 1C Stamen. | 5. <i>Mimulus moschatus</i> , <i>Musk-plant</i> . Colombia. |
| 1D Section of Ovary. | 6. <i>Chelone barbata</i> . Mexico. |
| 1E Stalk, magnified. | 7. <i>Torenia asiatica</i> . East Indies. |
| 1F Capsule and Calyx. | 8A. <i>Antirrhinum majus</i> . Capsule. |
| 2. <i>Digitalis purpurea</i> , <i>Purple Foxglove</i> .
England. | 8B. Capsule of <i>A. orontium</i> . |
| 2A Stamens. | 9A. Flower of <i>Calceolaria</i> . |

SCROPHULARIACEÆ.

large leaves. *Digitalis* was so named by Fuchs, from the flower being shaped like a thimble. *D. purpurea* (2) is one of the most ornamental of our native plants, and is admitted to gardens and shrubberies: although a strong poison, it affords a valuable medicine in the dried leaves. Several species are natives of Europe; *D. ambigua* and others with yellow blossoms are amongst the beautiful flowers that adorn the Alps of Switzerland and Tyrol, delighting the traveller and botanist. *Linaria* is abundant on hedge-banks in many districts; its flowers yield a yellow dye and a bitter medicine, but in sandy pastures it becomes a troublesome weed. *L. cymbalaria* grows chiefly on walls, and can endure the smoke of cities; it has a pungent flavour like cress, and is supposed to have medicinal value in India. *L. pilosa* of the Pyrenees has round leaves, densely hairy. *L. sapphirina* is an exceedingly elegant Portuguese species. *Antirrhinum* is of nearly similar appearance, but the flower has no spur, is merely swollen at the base. *A. majus*, seen on some of our old walls, affords many pleasing varieties or gardens. The seed-vessel (8) opening by three pores, has a strong resemblance to the head of a monkey. *Veronica chamædrys* (4), an example of the flat-flowered section of the tribe, is a general favourite, opening its delicate blue flower in spring on banks and in meadows. Before the true Tea was imported, it was used for a common beverage, and is still esteemed good in Sweden. All the European species are small herbs, but *V. speciosa* of New Zealand is a large plant bearing fine spikes of blue flowers; an arborescent kind has been discovered in Lord Auckland's Isles. *V. beccabunga* and other British species belong also to mountain rivulets in North America. *Mimulus moschatus* (5) is very fragile, but much cultivated for its agreeable scent. *Torenia* (7) is considered medicinal in Malabar. *Euphrasia*, Eyebright, is one of the plants constantly to be found on our chalk downs, occasionally used for its medicinal qualities. *Melampyrum* is a favourite with cows, and is said to cause good butter. *Rhinanthus*, the Yellow-Rattle, usually forms part of the crop in a hay-meadow. Like others of this tribe, the flowers resemble the nose of an animal. Such likenesses have been imagined for several of these flowers. *Chelone* (6) was so named from the Greek for a tortoise, which the back of the flower was thought to resemble in shape, though not in colour. *Buddleia globosa* is a shrub with honey-scented orange-coloured flowers: *B. madagascariensis* bears slender spikes of flowers. *B. Neemda* is an elegant Indian species; all have long narrow leaves, silvery beneath. *Teedla* and *Manulea* come from the Cape. *Browallia*, *Schizanthus*, and others, have been introduced from Chile and Peru by exploring travellers. *Paulownia* is a tree bearing noble spikes of purple flowers on brown stalks; rarely flowering in this country, forming an obvious link with Bignoniaceæ. *Maurandya* and *Lophospermum* are climbing plants flowering abundantly. Among useful medicinal plants in this tribe is *Gratiola officinalis* in the meadow pastures of Switzerland, *G. peruviana* in Peru, *Bramia serrata* in Brazil, and *Vandelia diffusa* in Guiana. *Scoparia dulcis* is a remedy for ague in Jamaica. *Picrorhiza* and *Herpestes* are intensely bitter herbs of India. *Sibthorpia* is a graceful little trailing plant in Cornwall, recording the name of the collector of the classical Flora Græca. *Limosella aquatica*, the humble Mud-wort of ponds, also finds its place in this tribe of varied aspect. The corolla of *Calceolaria* (9) is extremely enlarged at the base, forming a kind of slipper.

This Tribe is extensively dispersed over the world, from the Tropics to the coldest regions: in Central Europe it forms about one-twenty sixth of flowering plants; one species is found in Melville Isle, and several contribute to the scanty vegetation of Tierra del Fuego.

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Salvia (Wood)



L A M I A C E Æ.

THE DEAD-NETTLE TRIBE.

UNDER-SHRUBS and herbaceous plants: the stems are four-cornered, with opposite branches. The leaves are opposite, divided or undivided, without stipules, covered with receptacles of aromatic oil. The flowers are nearly sessile, opposite, sometimes in circles around the stem, sometimes solitary. The calyx is tubular, below the ovary, persistent, the odd tooth next the stem, five to ten-toothed, usually two-lipped. The corolla is of one petal, attached below the ovary, two-lipped, the upper lip whole or bifid, overlapping the lower in the bud. The stamens are four, two long, two short, placed upon the corolla alternately with the lobes of the lower lip, the two upper sometimes wanting; the anthers are two-celled, or one-celled at the point. The ovary is four-lobed, seated on a fleshy disk; the single style proceeds from the base of the ovary, the stigma is acutely bifid. The fruit is one or four small nuts, enclosed within the calyx, but uncovered. The seeds are erect, with little or no albumen.

† This Tribe has close affinity with Verbenaceæ, but is distinguished from that and all other allied tribes by its four-lobed ovary.

A fragrant aromatic oil exists abundantly in the leaves of these plants. None are unwholesome.

Lamium is a genus of very little beauty, and few or no aromatic properties, yet as it exhibits very distinctly the chief characters of this Order, it has been selected to give its name to the whole tribe. *L. maculatum* (1) is the prettiest of our native species; *L. album*, the white Dead-nettle, the most common. The only species thought worthy of a place in gardens is *L. orvala* of Italy, but even that is now rarely seen. *Salvia* ranks amongst the best of the tribe; it contains many herbs and under-shrubs, and is widely dispersed. *S. verbenaca* of our fields belongs to each great division of the globe. The leaves are usually covered with a fine network of veins, and pores full of aromatic oil. *S. officinalis* of South Europe

1. <i>Lamium maculatum</i> , Spotted Dead-Nettle. England.	4. <i>Scutellaria cordifolia</i> , Heart-leaved Scutellaria. Mexico.
1A Flower opened.	
1B Calyx.	
1C Calyx and Ovary.	5. <i>Betonica grandiflora</i> , Siberia.
2. <i>Salvia patens</i> , Spreading-flowered Salvia. South America.	6A. Flower of Salvia.
2A Ovary and Disk.	6B Ovary and Pistil.
	6C Section of Ovary.
	6D Seed.
3. <i>Galeobdolon luteum</i> , Yellow Weasle-Snout. England.	7A. Flower of Lavandula.
	7B Calyx and Pistil.

was formerly much used for its beneficial properties, and still retains a place in herb gardens, for cooking purposes. *S. Sclarea* is made into wine in some countries. *S. patens* (2) is now become a hardy inhabitant of our gardens, and is one of the most beautiful species. *S. splendens* is another fine specimen from Mexico, producing its bright red flowers late in the autumn. *S. glutinosa* is a tall plant, with pale yellow flowers, very abundant on mountains in Switzerland. *S. patula*, with white flowers, is Portuguese. *Galeobdolon* (3) inhabits shady places in Kent and a few other counties, but is not common; it grows also in moist woods on the Continent. *Scutellaria cordifolia* (4) is a brilliant example of a lowly genus; *G. minor* is a remarkably neat little plant, growing in marshy places in Wales and elsewhere; the calyx has a peculiar projection at the back, and closes when the flower falls. *Betonica grandiflora* (5) has the same character of a wide interval between the pairs of leaves, as our *B. officinalis*, which was once considered useful as a medicine, and in dyeing wool yellow. So numerous are the aromatic species in this tribe, it is impossible to describe them all. Many are of extensive value, and were amongst the earliest medicinal herbs used in our island; some were brought from the south by monks and missionaries. Rosemary grows by the sea on the south and west of France; by distillation, it yields a fragrant oil, and a substance resembling camphor is obtained from the leaves: the peculiarly fine flavour of Narbonne honey is supposed to be caused by the bees feeding on the flowers. The Welsh still consider it emblematical of repentance, and scatter it on graves. Melissa, Balm, affords honey to bees, and a pleasant tea, in former times much employed in fevers. One of the most fragrant of our native aromatic plants is *Thymus Serpyllum*, creeping over heaths and commons, becoming quite dwarf, like many others on chalk downs. *T. vulgaris* is the garden Thyme. *T. capitellatus*, the bracts covered with glands, is common in Portugal. *Mentha piperita* yields the medicinal Pepper-mint; *M. viridis*, the culinary Spear-mint, used also medicinally, both in the form of oil and water. *M. Pulegium* is the useful herb *Penny-royal*. But the most esteemed, probably, of European species, is Lavender, *Lavandula vera*, frequent in many parts of the Continent, particularly on the Lavendelberg, at Kreuznach, near the Rhine, and between the lakes of Neuchatel and Morat, in Switzerland. The fragrant volatile oil contained in the flowers (7) is a chief ingredient in Eau de Cologne and perfumery of all kinds. *L. Spica* yields an oil used in porcelain-painting. *L. Stechas*, French Lavender, is a native of the Stechades, on the south coast of France. Basil, Savory, Marjoram, and several others, are valuable as domestic herbs. Horehound and Ground-Ivy are also of common use in country districts as remedies for coughs. A species of *Ocimum* affords eatable tubers in Madagascar, but this is a rare instance in the tribe. In Brazil many species have valuable medicinal qualities, and are used by the natives. Martius describes the famous *Matico* as a *Phlomis*. The celebrated *Patchouli* of the East, used to stuff beds, is said to belong to this aromatic tribe.

Chiefly abundant in Temperate regions, between 40° and 50° of North latitude; growing in hot, dry situations, as well as in woods, hedges, and meadows; a few only in marshes. In the isles of the Mediterranean, they form about one-twentieth of the Flora. In the northern provinces of India, two hundred species have been discovered. To the north of Europe they diminish gradually, are rare in Lapland, and not found in Melville Isle.

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OROBANCHACEÆ.

THE BROOM-RAPE TRIBE.

HERBACEOUS plants, growing parasitically on the roots of other plants. The stems are without leaves, covered with brown scales. The calyx is below the ovary, divided, persistent. The corolla is of one petal, attached below the ovary, irregular in form, folded over in the bud. The stamens are four, two of them larger than the others; the anthers are generally two-celled, occasionally one-celled, the cells are distinct, often hooked at the top, bearded at the base. The ovary is above the calyx, one-celled, placed on a fleshy disk. The style is single, the stigma two-lobed. The seed-vessel is a capsule, enclosed within the withered corolla, one-celled, two-valved, each valve having one or two plates along the middle, bearing seeds. The seeds are of indefinite number, minute, and contain fleshy albumen.

This Tribe has affinity with Fig-worts, in the two long and two short stamens, but it is known by the one-celled capsule, and parasitic habit of growth.

Astringent and acrid properties exist in these plants.

Orobanche is said to have been named from the Greek, in allusion to its habit of attaching itself to, and strangling the Orobis and other plants of the Vetch or leguminous kind. Some parasites do not molest the tree or herb on which they grow, but the Orobanche is often very injurious, and by fixing on the roots, draws away the valuable nourishment from the plant. The Genevese botanist, Vaucher, observed that the seeds of *O. racemosa* will lie many years in the ground unless they chance to come in contact with Hemp, when they immediately begin to germinate. He found, moreover, that they can only grow on young plants, being unable to attack and penetrate stronger roots. *O. minor* (1) is a small species, but very hurtful when abundant in a clover field, as it often is in Norfolk and Essex. Unless the earth be carefully removed from about the plants, it would not be suspected to have any connexion with the clover, as it is only at the points of the roots that they grow together; where it has once taken possession of a field the crop becomes too scanty to be of any value. *O. major*

1. *Orobanche minor*, Lesser Broom-rape.
 1A Seed-vessel, open.
 1B Section of Seed-vessel.
 2. *Lathraea squamaria*, Tooth-wort. England.
 2A Seed-vessel.

- 2B Seed-vessel, opened.
3. *Æginetia pedunculata*, Stalked Æginetia.
 East Indies.
 3A Flower, opened. 3B Stamens.
 3C Pistil. 3D Ovary.

OROBANCHACEÆ.

is a stouter darker plant, chiefly attached to Broom or Furze. *O. elatior* is of brighter hue, and parasitic on clover; these three species grow on a gravel soil; *O. rubra* on basaltic rocks in Scotland and Ireland, at Staffa, and the Giant's Causeway: this is probably not parasitic, for few other plants vegetate on the thin layer of earth which covers the rocks. *O. fatida* of a red brown hue in the whole plant is a native of Portugal. A Russian species, *O. ammophila*, bears blue flowers on its brown stem. Some of these plants are said to have astringent properties; *O. epithymum* yields a bitter tonic, used in some countries medicinally; the flowers are slightly fragrant. Orobanche is more plentiful on the Continent than in Britain, twenty-four species being found in the Flora of Germany. Another nearly similar genus, of dull pale aspect, is the *Lathrea* (2); growing chiefly in the shade of woods; it is devoid of bright colour in the flowers, and the leaves are of a pale brown. The manner of growth in some degree resembles that of ferns, the fibrous roots proceeding from an underground portion of the stem, which remains horizontal before rising upwards. This is one of our British plants which finds a suitable temperature in the upper regions of the Himalayas. *Æginetia pedunculata* (3) is a more brilliant example of this tribe than any British species; the form and colour of the flower remind forcibly of the *Gesnera* tribe, and seem to indicate an affinity which does in fact exist between the two tribes, although they differ in some important points of structure. *Æginetia pedunculata* grows on the roots of tall grasses in Bengal, frequently also on various kinds of Bamboo, springing up, blossoming, and producing seed during the rainy season. Whilst in flower it is singularly beautiful: the whole plant is of a soft fragile texture, slightly scented like mushrooms. The root is fleshy and grey; the hollow sheath-like calyx contains in its base a clear liquid; the capsule is the size of a hazel-nut, and is filled with numerous minute dark-brown seeds. *Æ. indica* grows in the valleys of the Himalaya, and is used medicinally by the natives. *Epiphegus virginiana* is known as a medicine in North America. *Phelipea*, or *Cistanche lutea*, is employed as a black dye for the ropes made from the fibres of the Doom Palm of Thebes: it is a native also of Portugal, bearing several large yellow flowers on its brown scaly stem. *P. lanuginosa* of the Altai Mountains is blue.

This Tribe is common in Europe, particularly in the southern countries; it is found also in Africa, at the Cape of Good Hope, and in Barbary; it exists, though rarely, in Central and Northern India, and in North America.

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Vervain Tribe

VERBENACEÆ.

THE VERVAIN TRIBE.



TREES, shrubs, and a few herbaceous plants. The leaves are generally opposite, simple, or compound, without stipules, thickly occupied by transparent pores in *Myoporum*. The flowers are on opposite branches, or on alternate spikes, or from the base of the leaf-stalks, and solitary. The calyx is tubular, five-parted, persistent, placed below the ovary. The corolla is of one petal, tubular, attached below the ovary, generally irregular at the top, sometimes nearly equal, or two-lipped, deciduous. The stamens are usually four, two shorter, seldom equal. The ovary is two or four-celled, the style single, arising from the top of the ovary, the stigma bifid or whole. The fruit is a drupe, a nut, or a berry. The seeds contain a small portion of fleshy albumen, or none.

This Tribe is chiefly distinguished from *Lamiaceæ* by the concrete ovary, and terminal style, and the general absence of aromatic pores in the leaves.

Slightly bitter and aromatic properties exist in a few only of these plants.

Verbena or Vervain is said to be derived from an old Celtic name. *V. officinalis* (1) was held in high repute in ancient times for various solemn rites and sacrifices by Greeks and Druids, as well as for medical purposes, but is now, with many other European herbs, discarded for others from hotter countries generally. It is a common plant by the wayside, but attracts very little notice. This is the only English species, but we find several more in America. *V. triphylla* is remarkable for the extreme fragrance of the leaves, the surface of which is covered with small glands of oil, the delicious scent remaining long after the leaves are dried. The flowers are minute, pale purple, and of no beauty, but the plant is much cultivated on account of the leaves; in Devonshire it flourishes in the open air, and grows to the height of five or six feet. *V. chamædrifolia* (2) is now become one of the most ornamental flowers of the garden, producing abundantly

1. <i>Verbena officinalis</i> , Common Vervain. England.	4. <i>Lantana aculeata</i> , Prickly Lantana. West Indies.
2. <i>Verbena chamædrifolia</i> , Germander-leaved Verbena. Buenos Ayres. 2A Section of Flower. 2B Ovary and Pistil. 2C Calyx and Bract. 2D Stamens.	5. <i>Myoporum parvifolium</i> , Small-leaved Myo- porum. New Holland. 5A Seed-vessel. 6A. Fruit of Callicarpa. 6B Seed-vessel.
3. <i>Clerodendrum fallax</i> , Scarlet Clerodendrum. East Indies.	7A. Fruit of <i>Gmelina arborea</i> . 7B Section of Fruit.

its bright red blossoms until autumn frosts. Several other varieties have been produced by cultivation from South American species; the white flowers of one are very fragrant in the evening. *Clerodendron* is a genus belonging to the East. *C. fallax* (3) is a beautiful shrub for the conservatory, the leaves sometimes nine or ten inches in length, and the scarlet flowers continuing to come forth for many weeks. *C. fragrans* is very sweet-scented, and the flowers often become double. *C. deflexum* is a shrub on the mountains of Penang. *Lantana* belongs chiefly to the West Indies, but is a frequent inhabitant of our greenhouses; the flowers are usually orange or yellow, some variable in hue. *L. aculeata* (4) is prickly on the lower part of the stem. *L. macrophylla* yields a beverage taken as tea in Brazil; *L. pseudo-thea* is also thus used: the leaves of other species in Chili contribute to aromatic baths. *Stachytarpheta* is considered in Jamaica as a good substitute for tea. *Callicarpa* (6) is said to possess aromatic properties in the bark; that of *C. lanata* is sometimes a substitute for Betel to the Cingalese, and the Malays believe it to have medicinal qualities.

The most important species in this Tribe is undoubtedly the *Teeka* of Malabar, the well-known Teak-tree, *Tectona grandis*. It forms a large and valuable portion of the extensive forests on the mountains of Coromandel, Ceylon, and Java, attains a great size, and yields the most durable timber yet discovered for ships; it contains abundant particles of silex, which renders the texture of the wood extremely hard. The flowers are very small, the leaves are deciduous, large, and covered with small rough conical points; the natives obtain from them a useful red dye. *Gmelina*, named after the author of the *Flora Sibirica*, is a fine evergreen genus of the East Indies; *G. arborea* (7) the *gumhar* of the Hindoos is a large tree with spreading drooping branches, the timber is very hard, though light in weight, and rivals the Teak in durability, being equally secure from the ravages of the Teredo. Another remarkable tree belonging to this Tribe is *Avicennia tomentosa*, named from the famous Persian sage born in the tenth century, now known as the White Mangrove of South America; the first specimen of Tropical vegetation that greeted Humboldt when he landed on the coast of Cumana. These singular trees flourish best in salt swamps, and are found on the margins of all the Indian estuaries; like *Rhizophora*, stretching out long creeping roots over the mud. The seeds have also the remarkable vitality which causes them to germinate before the fruit falls; the tender leaves and roots of the young plant may be often seen piercing the fruit whilst still on the tree. In shape and size the fruit nearly resembles the almond. The bark is employed for tanning, and a resinous substance which exudes was formerly eaten by the natives of New Zealand. The drupaceous fruit of *Premna esculenta* and others are eatable; but some are very acrid, as that of *Vitex trifolia*, the Wild Pepper of India.

This Tribe is common in the Tropics, and in the Temperate regions of South America; rare in Europe, Northern Asia, and North America. In the Tropics it is developed in large trees and shrubs, in cooler climates the species are herbaceous. *Myoporum* belongs chiefly to Australia.

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Acanthaceae
The Acanthus Tribe

ACANTHACEÆ.

THE ACANTHUS TRIBE.

SHRUBS and herbaceous plants, sometimes having simple hairs, very rarely in a stellate form. The leaves are opposite, rarely in fours, or unequal pairs, without stipules, simple, entire at the edges, or serrated, sometimes sinuated, or lobed, and spiny. The flowers are terminal, or from the base of the leaf-stalks, in spikes, or branching panicles, sometimes solitary; opposite or alternate on the branches. At their base are three bracts; the central one usually large and leafy, and spiny if the leaves are so, enclosing the calyx, or forming a substitute for it. The calyx is four or five-lobed, equal or unequal, the two side sepals very small in *Acanthus*, generally much imbricated and divided, sometimes entire, persistent, occasionally wanting, as in *Thunbergia*. The corolla is of one petal, attached below the ovary, two-lipped, the lower lip overlapping the upper in the bud; occasionally one-lipped, as in *Acanthus*, sometimes nearly equal, deciduous. The stamens are usually two, both having anthers, sometimes four, the two longer only being fertile; the anthers are two or one-celled, opening lengthwise. The ovary is seated on a disk, two-celled, composed of two carpels, with one style, and a two-lobed stigma. The capsule is two-celled, the cells two or many-seeded, bursting elastically, with two valves which bear seeds on their edges. The seeds are roundish, suspended by hard, cup-shaped, or hooked projections from the plates of the valves; they contain no albumen.

This Tribe has affinity with *Bignoniaceæ*, and *Scrophulariaceæ*, but is distinguished from the former by wingless seeds, and from both by the large leafy bracts, and the hooked processes attaching the seeds.

Mucilaginous and slightly bitter properties exist in these plants.

Acanthus was named from the Greek for a spine, the leaves being usually spiny at all the points. Pliny describes an *Acanthus* on the lawn of his garden, and such a position is most favourable for it, the leaves spreading around in a very noble manner, when free space is allowed for growth; if in a border crowded amongst other plants its peculiar character is concealed. The foliage of *Acanthus*

1. *Acanthus spinosus*, *Prickly-leaved Acanthus*.

Italy.

- | | |
|----------------------------|------------------|
| 1A Flower. | 1B Outer Sepals. |
| 1C Inner Sepals. | 1D Stamen. |
| 1E Section of Seed-vessel. | |

2. *Justicia carnea*, *Pink-flowered Justicia*.

Rio Janeiro.

2A Calyx and Bracts.

2B Stamen.

3. *Thunbergia alata*, *Winged-talked Thunbergia*

East Indies.

4A Flower of *Strobilanthes*.

4B Flower, opened.

4C Ovary.

4D Section of Ovary.

F F

ACANTHACEÆ.

has the honour of having afforded one of the most elegant and permanent types of ornament to architecture. In the transparent atmosphere of Greece, the simple yet striking effects of light and shade on vegetable forms, rendered them the best and most natural objects to be adopted as studies by the skilful artist. *A. mollis* has extremely large, gracefully waved leaves, which may be clearly traced in classical art. *A. spinosus* (1) is a beautiful species, perfectly hardy in our climate; the spike of flowers rises to three feet in height, and being of a firm texture, remains long an embellishment to the garden. The petal is one-lipped, the large upper sepal of the unequal calyx forming a kind of hood to the stamens and pistil. The capsule shows the chief distinguishing mark of this Order, the hooks which support or bear the seeds. *A. niger* of Portugal has dark spineless leaves. *A. spinosissimus* of South Europe has deeply pinnatifid leaves with strong white spines. *A. repens* and *A. volubilis* are East Indian, of different habit of growth, the one creeping, the other climbing. The mucilaginous roots of some species have been used in medicine. *Justicia* abounds in the Tropics, the name records that of an eminent Scotch horticulturist. *J. carnea* (2) of modern introduction to European conservatories, is one of the finest species. *J. pectoralis* in the West Indies yields a mucilaginous syrup, and the leaves are used by the natives for healing purposes. *J. biflora* of Egypt is also an emollient plant. *J. paniculata* is considered a valuable tonic in India. *Thunbergia*, an example of the section without calyx, and of a climbing nature, was so called in honour of a learned professor of botany in Upsal, who travelled in Africa and Asia. The peculiar colour of the flower of *T. alata* (3) is a pleasing variety in English greenhouses. *T. coccinea* of Nepal has a bright scarlet flower; *T. fragrans* of India is white and sweet-scented, confirming the theory that fragrance is most frequently combined with white flowers. *Ruellia* of South America and the West Indies contains several purple and blue species well known here. The deep blue dye called *Room* in Assam is obtained from a *Ruellia*. *Barleria* is an East Indian genus, named after a French Dominican, who travelled and studied botany in the seventeenth century, and published drawings of plants rare in his time. *Porphyrocoma*, *Beloperone*, and others are later importations, chiefly from S. America. *Aphelandra fulgens* is a brilliant species of Mexico. *Gendarussa vulgaris* is considered a remedy for rheumatism in the East Indies. *Phayloopsis longifolia* is a native of Sierra Leone. *Mendozia* of Brazil is an exception in this Tribe, the fruit being a drupe, containing one seed.

This Tribe is chiefly Tropical, abounding especially in the Tropics of Africa and America. A few species only inhabit the United States of America. Acanthus extends northwards into Greece.

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Utriculariaceae
The Bla. + Tribe.

UTRICULARIACEÆ.

THE BLADDER-WORT TRIBE.

HERBACEOUS plants inhabiting marshes or water. The leaves grow from the top of the root, are either whole or compound, resembling little roots, and bearing small bladders of air or water. The flower-stalk is generally single, seldom branching, and is either naked or clothed with minute scales like stipules, sometimes bearing little vesicles in whorls. The flowers are single or in spikes, or in many-flowered branches, with a single bract, seldom without. The calyx is below the ovary, divided, persistent, partly two-lipped, the upper lip generally three-notched, the lower two-notched. The corolla is of one petal, placed below the ovary, irregular and two-lipped; the lower lip produced into a spur, which is sometimes double. The stamens are two, included within the corolla, and inserted into its base; the anthers are one-celled, sometimes contracted in the middle. The ovary is composed of two carpels, united at the edges, one-celled. The style is single, very short, the stigma bilabiate. The capsule is one-celled, many-seeded, with a large central plate to which the seeds are attached. The seeds are minute, without albumen.

These herbaceous plants have most affinity with Scrophulariaceæ, chiefly distinguished by having a one-celled capsule: they are connected with Primulacæ through *Hottonia*.

A peculiar property of thickening milk exists in the leaves of *Pinguicula*.

Utricularia is named from *utricula*, a little bottle, alluding to the vesicles of several species. The plants grow abundantly in the rivulets, lakes, and marshy pools of hot countries; three species are natives of Britain, in different localities; few are known beyond their respective stations, being difficult of cultivation. The flowers are extremely fugacious and delicate, and can scarcely be preserved in a herbal; the brilliant colour of the petals changing to black when pressed and dried; those of the British species are yellow; those of the Tropics and other hot regions are generally blue. The structure of the small bladders is very curious; during

1. *Utricularia vulgaris*, *Greater Bladder-wort*.
England.

1A *Pistil*. 1B *Capsule*.
1C *Vesicle*, magnified.

2. *Utricularia Humboldtiana*.
Savannahs, Guiana.
2A *Calyx and Ovary*.
2B *Calyx and Capsule*.
2C *Section of Capsule*, magnified.

2D *Stamens*. 2E *Pollen*, magnified.

3. *Utricularia reticulata*.
Rice-grounds, East Indies.

4. *Pinguicula vulgaris*, *Common Butter-wort*.
England.

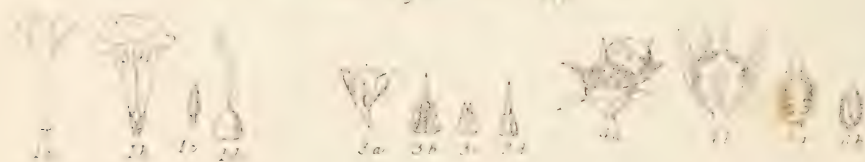
4A *Calyx, Pistil, and Stamens*.
4B *Stamen*. 4C *Pistil*.
4D *Section of Capsule*.

UTRICULARIACEÆ.

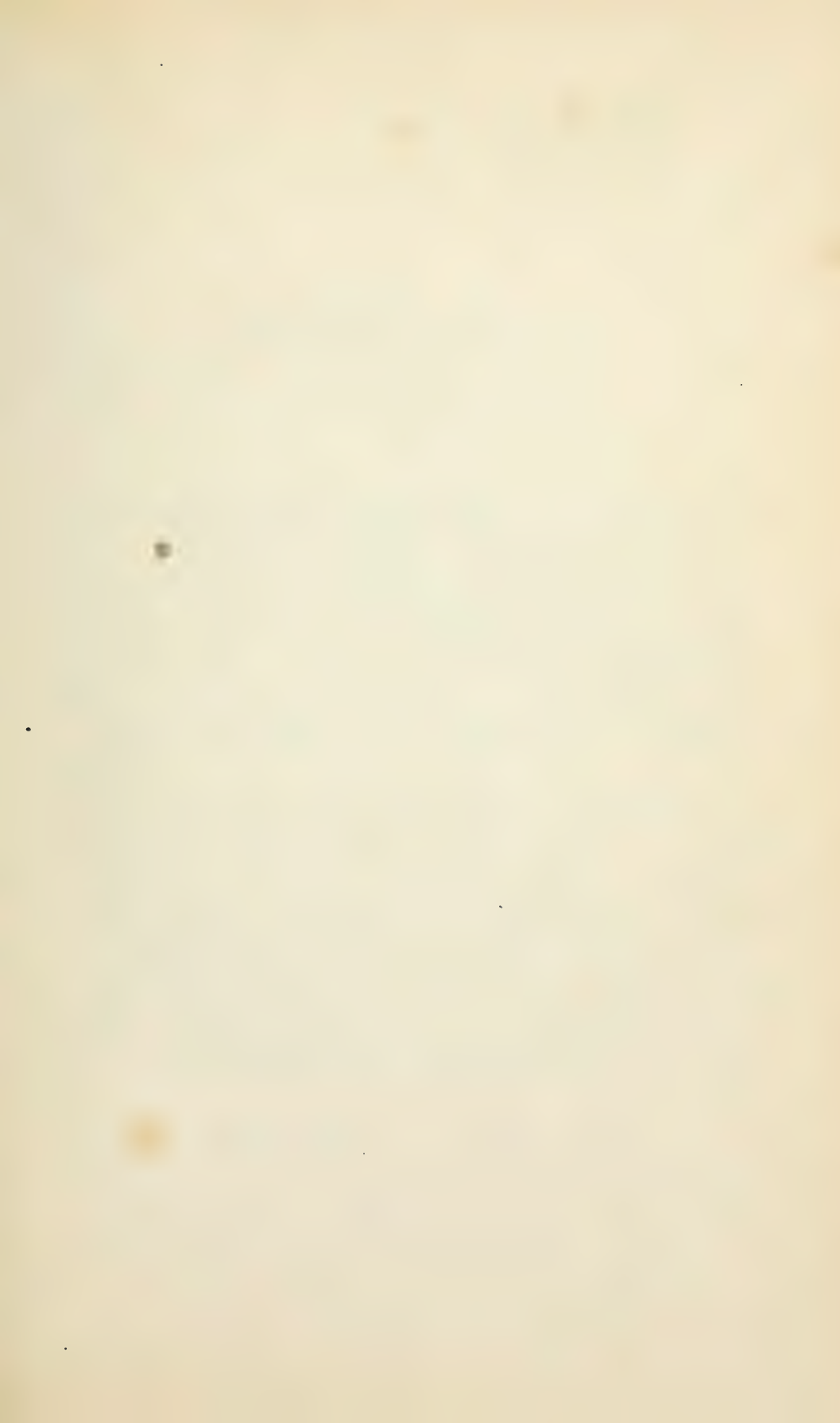
the early growth of the plant they are wholly submerged, and contain only water, but when the flowers begin to be developed a change takes place, they rise to the surface, and are found to be filled with air only, small valves closing the orifice. When the seeds are ripening they again sink below. The aquatic species are amply provided with vesicles, and are kept floating by their aid; some which belong to the Tropics are fixed by fibrous roots in the marshes, requiring no other support, and have no vesicles. *U. vulgaris* (1) is our finest species, and may be seen in ditches and deep pools on the south coast; from the finely-divided leaves, as well as form of the flower, it is sometimes called Hooded Milfoil. *U. Humboldtiana* (2) grows in the elevated marshy savannahs of the Roraimé mountains in Guiana, the stem rising to the height of three or four feet, bearing several singularly formed and very elegant purple flowers. This is a remarkable instance of the manner in which an European genus is developed into a more noble type in Tropical regions. It was discovered adorning its native savannahs by Sir Robert Schomburgk, who dedicated it to his learned friend Alexander von Humboldt, but it is one of those fragile ornaments of the creation not destined for transportation or dispersion. *U. reticulata* (3) is a native of inundated rice-grounds in the East Indies, twining amongst the rice-stalks, with its round smooth stems destitute of leaves. The pale netted flower is a curious variety from other species. *U. montana* adorns with its delicate white flowers the sunny meadows around the mountains of the island of Martinique. During the late voyage of Mr. Spruce in the *Amazon*, he found a remarkable species, *U. quinqueradiata*; the flower-stalks, about two inches long, have an involucre of five rays, spreading horizontally, which floats and supports the plant with its large yellow flower, like a floating lamp. The rays are composed of transparent cells, convex on the surface, forming a kind of chain of vesicles. *U. uniflora* growing on the white sand of the shore is the simplest species yet known; the stem, the size of a sewing-needle, is fixed in the sand by a small cone of roots; it bears no leaves, only a small tubular bract below the simple white flower. *U. nelumbæfolia* is a curious species described by travellers in South America; it makes its habitation in the pools of water accumulated from rain or dew in the hollows of the leaves of a plant of the Pine-apple tribe, probably a *Tillandsia*, or some allied genus. The roots derive nourishment from the water entirely, for it is no parasite, and has no connexion with the plant which thus in so singular a way affords it shelter. The roots creep from one leaf to another, and the *Utricularia* spreads and flourishes. *Pinguicula* inhabits the marshes and bogs of Britain and many other countries. *P. vulgaris* (4) abounds also in Sweden and Norway, where the leaves are used by the peasants to thicken the milk of reindeer, which is effected without the separation of curd or whey, and is esteemed as a delicacy, the luxuries of food being in those northern countries of a simple nature. The leaves appear to have a certain degree of irritability, bending backwards when the plant is taken out of the ground. *P. lusitanica* is an example of a Portuguese plant migrated to Britain; it grows in Dorsetshire and in the south of Ireland, and has also been found in Scotland. This genus is represented in Fuegia by *P. antarctica*, the chief distinguishing character being a spur much shorter than that of *P. lusitanica*. *Genlisea* belongs exclusively to Brazil.

This Tribe inhabits marshes, streams, and still waters in all parts of the world; most abundant in the Tropics.

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Primulaceae
The Primrose Tribe





PRIMULACEÆ.

THE PRIMROSE TRIBE.

ANNUAL or perennial plants, generally of herbaceous nature, and sometimes nearly shrubby. The leaves usually proceed from the top of the root, or else are opposite, or alternate, or in whorls on the stem; they have no stipules. The flowers are either on a simple stem arising from the root, or in an umbel at the top of the stem, or variously arranged in the axils of the leaves on the stem. The calyx is five-cleft at the top, half or entirely below the ovary, regular and persistent. The corolla is of one petal, attached to the base of the ovary, regular in form, the top divided into five segments, seldom four; Glaux is without petals. The stamens are inserted upon the corolla, and are equal in number to its segments, and placed opposite to them. In *Samolus* and *Lysimachia* imperfect stamens are alternate with them. The ovary is one-celled, the style is single, the stigma capitate; the seed-vessel is a capsule opening by valves, with a central distinct plate; that of *Anagallis* is a pyxis, opening with a lid at the top. The seeds are numerous, with fleshy albumen.

This Tribe of herbaceous plants has much affinity with *Myrsinaceæ*, which is chiefly distinguished by the shrubby nature of the species and the fleshy fruit.

Some of these flowers have soporific properties; the roots are sometimes bitter and acrid.

The name of *Primula* denotes its being amongst the first plants to flower in the spring. *P. vulgaris* is one of the earliest tokens of departing winter, adorning our woods and hedge-banks some weeks before other plants have opened their buds. By garden cultivation it has produced double varieties of all colours. *P. veris* (1) is the sweet-scented favourite cowslip, plentiful in the meadows and copses of some districts of England, as well as of most European countries. The flowers make an excellent wine, much esteemed by farmers' wives. *P. auricula*, a native of the Alpine regions of Europe, has been developed into countless beautiful varieties; the flowers exhibit various shades of purple and brown, the peculiar powdery covering

1. *Primula veris*, *Common Cowslip*. England.

1A Flower. 1B Flower, opened.

1c Stamen. 1d Pistil.

2. *Dodecatheon Meadia*, *American Cowslip*.
Virginia.

3. *Cyclamen europæum*, *Common Cyclamen*.
Europe.

3A Calyx. 3B Stamens and Pistil.

3c Stamen. 3D Pistil.

4. *Anagallis arvensis*, *Scarlet Pimpernel*.

4A Seed-vessel. 4B Section.

5. *Anagallis Monelli*. Italy.

6A Ovary of Aretia. 6B Seed.

renders it a singular plant, and it was formerly an object of much attention, now in some degree superseded by the immense number of new plants imported from all lands. In some of our large manufacturing towns in the north it still affords interesting occupation to the workmen to raise new varieties of Auriculas. *P. farinosa*, of Yorkshire, is one of our most delicate native flowers; in Switzerland it is also frequent. Five species only belong to Britain, but the German and Swiss Floras contain twenty-one; *P. longiflora*, *P. villosa*, *P. integrifolia*, and others, inhabiting the pastures and rocks of the higher Alps. Dodecatheon (2) is one of the first importations from Virginia; its specific name of Meadia records a celebrated physician and naturalist, whose monument may be seen in the nave of Westminster Abbey. Cyclamen is another of this tribe, which sends forth its welcome flowers in the early months of the year. *C. europæum* (3) is become rare in this country, though it is common in the woods of Austria and Lombardy; the flattened bulbs lie on the surface of the ground, and are eaten by pigs. After the flowers are withered, the stalks curl round, and remain amongst the leaves till the seeds ripen. Anagallis appears to have been known to Pliny and Dioscorides. *A. arvensis* (4) is frequent in corn-fields and open places, one of the few red flowers indigenous in this country, and, like the Poppy and all bright red flowers, is found in situations exposed to the sun. By peasants it is called Shepherd's-clock, as it closes its flowers after noon-day; this power, however, seems to be lost if the plant be gathered and placed in water. *A. tenella* is a very delicate little trailing plant on bogs, in Wales and elsewhere. *A. Monelli* (5) flourishes well in our conservatories. Hottonia is the elegant Feather-foil of our streams and ditches, the slender stalks rising above the water, bearing whorls of pink flowers. Lysimachia grows in watery places or moist woods; all the British species have yellow flowers. *L. thyrsoiflora* is chiefly found in Scotland. One of the most widely dispersed genera of this tribe is Samolus, belonging to every quarter of the world. *S. Valerandi* in the ditches of our south coast, may be examined with interest, the form of both flower and capsule being remarkably neat; a small bract is on the middle of each flower-stalk. *S. ebracteatus* grows on the shores of Cuba. *S. floribundus* on the coast of Peru; *S. littoralis* on the coast of New Holland. Trientalis europæa is rarely to be seen in the north of England, but it abounds in the woods of Norway; the stem is about four inches high, crowned by a few leaves and brilliant white flowers; the black seeds are covered with a white netted skin. Soldanella and Aretia are among the beautiful little Alpine plants which ascend to the limits of perpetual snow. In Lapland and Siberia we trace this tribe in the forms of Diapensia and Androsace. Douglasia blossoms amidst snow on the Rocky Mountains of North America.

This Tribe is most common in the northern and colder regions of the globe; rare within the Tropics, where it only exists on the sea-shore or on lofty mountains.

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Centauraceae
The Leadwort Tribe

PLUMBAGINACEÆ.

THE LEAD-WORT TRIBE.

UNDERSHRUBS and herbaceous plants. The leaves are alternate, or in clusters, undivided, somewhat sheathing at the base, sometimes marked with transparent dots. The flowers are either in loose panicles or combined into close clusters. The calyx is tubular, plaited, persistent, sometimes coloured. The corolla is of one petal, with a slender tube of five petals with a long narrow claw. The stamens are of definite number, in *Plumbago* fixed to the base of the ovary; in *Statice* and its immediate allies, placed on the petals. The ovary is one-celled, one-seeded; the styles usually five, with the same number of stigmas. The fruit is a nearly-closed utricle. The seeds contain a small quantity of mealy albumen.

This Tribe has some affinity with *Plantaginacæ*, but is distinguished by the plaited calyx.

Tonic and astringent, acrid and caustic properties exist in these plants.

Plumbago derives its name from a substance found in the root of the European species, in colour resembling black lead; it is used as a remedy for toothache in France, but stains the teeth grey, this peculiar caustic colouring matter is called *Plumbagine*. *P. europæa* is the only species belonging to Europe, but several exotic species are cultivated in our conservatories for ornament, though not for use. *P. capensis* (1) is a graceful plant, and produces its delicate flowers throughout the summer. *P. rosea* (2) was brought from the East Indies by the celebrated Dutch traveller and botanist Rumphius, in the last century; he called it *blister-root*, from the use made of it by the natives. *P. scandens* climbs over hedges in St. Domingo and Rio Janeiro; it has a white flower, and is considered to possess medicinal properties in South America. *P. zeylanica* is found in Ceylon and in Australia. *Statice* is a genus known to, and described by Pliny; it is dispersed throughout Europe and from Siberia to the Mediterranean, is found also in Egypt, in the Canaries, and at the Cape of Good Hope. *S. purpurata* (3) having been introduced from South Africa in 1800, has been occasionally seen in our gardens from that time. *S. speciosa* and others are natives of Russia,

1. *Plumbago capensis*, *Blue Plumbago*.

Cape of Good Hope.

1A *Stamens and Pistil.* 1B *Ovary.*

2. *Plumbago rosea*, *Red Plumbago*.

East Indies.

3. *Statice purpurata*, *Purple Statice*.

South Africa.

4. *Armeria vulgaris*, *Common Thrift*. England.

4A *Calyx.* 4B *Section of Flower.*

4C *Ovary and Pistil.*

PLUMBAGINACEÆ.

all of a durable nature and pleasing aspect. *S. imbricata*, a shrub of Teneriffe, is a beautiful species, with small purple flowers. *S. Caroliniana* is a very powerful astringent, used medicinally in America. Several are woody shrubs; in Cabul a large portion of fuel wood is obtained from *Statice*. *S. Limonium* is the Sea Lavender, frequent on the muddy shores of the mouths of our smaller rivers. The flowers of this genus and *Armeria* have five separate petals, the stamens attached to their base. *Armeria vulgaris* (†) grows plentifully on most parts of the English coast, particularly abundant on the shores of the Isle of Wight and other southern positions, extending along the cliffs to the Land's End westward. It forms a good bordering for gardens, and is preferred for that purpose in some situations where the soil is favourable. *Armeria* differs chiefly from *Statice* in the flowers being collected in close round heads, having an involucre at the base, forming a kind of sheath at the top of the stalk. *Cerastigma* is a native of China. *Vogelia* belongs to the Cape; it records the name of a zealous but unfortunate explorer of African plants, who fell a victim to the climate. *Ægialitis* grows amongst the mangroves of Northern Australia, and in the Delta of the Ganges.

This small Tribe is found thinly scattered from Greenland to Cape Horn, inhabiting salt marshes and sea-coasts, in Temperate regions; abundant on the shores of the Mediterranean, and in the southern provinces of the Russian empire; rare in the Tropics and in China. *Plumbago* belongs to Europe, India, America, the Cape of Good Hope, and Australia.

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The Kuo-wort Tribe

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PLANTAGINACEÆ.

THE RIB-WORT TRIBE.

HERBACEOUS plants, a few of which are shrubby, usually stemless. The leaves grow in tufts on the ground, and are opposite or alternate in the species having a stem, flat and ribbed, or tapering and fleshy. The flowers grow in spikes, or solitary, as in *Littorella*; the calyx is four-parted, persistent. The corolla is of one petal, membranous, fixed below the ovary, four-parted at the top, persistent. The stamens are four, inserted into the corolla alternate with its segments. The filaments are thread-like, soft, bent inwards in the bud; the anthers are two-celled. The ovary is composed of a single carpel, without a disk, two-celled, sometimes four-celled by the angles of the central plate; the style is single, slender; the stigma hairy, simple, rarely partly bifid. The capsule is membranous, opening transversely, bearing the seeds on a loose central column. The seeds are many, two, or single, and contain fleshy albumen.

These plants have some affinity with *Plumbaginaceæ*.

The herbage is slightly astringent, the seeds mucilaginous.

Plantago is a genus of plants of peculiar aspect, in some points forming a kind of link with the grasses; the long leaves, with strong linear ribs, giving a name to the Tribe, and the slender spike of inflorescence, both bear some resemblance to several of the grasses. *P. major* (1) is one of our most frequent species, growing by the wayside almost everywhere throughout the country; it is equally common in all parts of Europe, and has been observed in Japan. The numerous small seeds are the favourite food of birds, and the leaves have still a reputation among peasants for healing slight wounds. A variety called *Rose-plantain* is thought sufficiently pretty to be admitted into the flower-garden. *P. coronopus* (2) is often too abundant on lawns, spreading over it to the exclusion of the fine tufted grasses; the name of *Star of the Earth* expresses its form, as the leaf and stalks lie close

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| 1. <i>Plantago major</i> , <i>Greater Plantain</i> .
England. | 4. <i>Littorella lacustris</i> , <i>Plantain Shore-weed</i> .
England. |
| 1A <i>Flower</i> . 1B <i>Seed-vessel</i> . | |
| 1C <i>Seed</i> . | |
| 1D <i>Seed magnified</i> . | |
| 2. <i>Plantago coronopus</i> , <i>Star of the Earth</i> .
England. | 5. <i>Bougueria nubicola</i> .
Bolivia. |
| | 5A <i>Flower, magnified</i> . |
| | 5B <i>Section of Seed</i> . 5C <i>Stamen</i> . |
| | 5D <i>Seed-vessel</i> . 5E <i>Bract</i> . |
| 3. <i>Plantago squarrosa</i> , <i>Leafy-spiked Plantain</i> .
Egypt. | 6A. <i>Flower of P. lanceolata</i> . |
| | 6B <i>Ovary and Pistil</i> . |
| | 6C <i>Section of Ovary</i> . |
| | 6D <i>Seed</i> . 6E <i>Seed-vessel</i> . |

PLANTAGINACEÆ.

pressed on the ground. In former times, when vegetable food was not so choice and varied as at present, the leaves were eaten as salad, but they have an unpleasant flavour. This is one of our native plants which an English traveller will recognise at Funchal in Madeira. *P. radicata* of Portugal is of similar character, but much larger. *P. lanceolata*, the Rib-grass of pastures, is not esteemed here, but is said to afford good fodder for cattle on the Swiss Alps. *P. maritima* is of varied growth, according to the locality; it may be found with thick fleshy leaves on rocks bordering the Solway Frith and other salt situations, thus conforming to the general rule that fleshy-leaved plants thrive chiefly near the sea; for when growing in situations removed from the influence of saline air or soil, as by the side of small rivers in the Craven district of Yorkshire, the leaves are flat, and scarcely more fleshy than those of other species. *P. squarrosa* (3) is an example of the few species which have leaves on the stem, not all proceeding from the root; a large supply of potash is yielded from the ashes. *P. cynops* is shrubby, grows in the south of Europe, and is supposed to be referred to by Pliny. In Madeira is found *P. arborescens*. *P. remotiflora*, *P. amplexicaulis*, and *P. penicillata*, form part of the vegetation of the mountains of Seinde and Beloochistan at an elevation of 5000 feet. The remote Auckland Isles are the abode of a species much resembling the British *P. media*, which has been named *P. Aucklandica*. The largest known species is *P. maxima*, the flower-stalks measuring thirty inches in height. *Littorella* (4) is a delicate little plant, growing in watery sandy places; like some Plantains, the flowers have extremely long stamens, curved inwards in the bud, then erect, afterwards becoming flaccid and drooping. The pistil and stamens are in separate flowers. It is the only species known, and is found on the margins of ponds or lakes. *Bougueria* (5) was named by Decaisne after its discoverer, who accompanied Condamine on a journey in Peru. It is a genus intermediate between *Plantago* and *Littorella*, having the habit of growth of the former, and a capsule nearly resembling that of the latter. Bouger found it growing in the fissures of the porphyritic rocks of the mountains that rise above the city of Potosi, at an elevation of 14,000 feet. The root is thick and large in proportion to the plant; the linear leaves are somewhat fleshy, and when young are covered with white hairs. Perfect and imperfect flowers exist on the same spike; the capsule contains one seed, and remains closed. Although *Plantago* is a lowly genus, it has been observed in almost every country, in Morocco and at the Cape of Good Hope, in India, Japan, Kamtschatka, Patagonia, and the Andes. The mucilaginous seeds are of some utility. Those of *P. arenaria* are said to be employed in the dressing of muslin.

This Tribe is scattered over the whole world, in various localities; most abundant in cool or Temperate climates.

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Nyctaginaceae
The Marvel of Peru Tribe.

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NYCTAGINACEÆ.

THE MARVEL OF PERU TRIBE.

CHIEFLY herbaceous plants, both annual and perennial, a few shrubs and trees. The leaves are usually opposite, sometimes alternate, almost always unequal, without stipules. The flowers grow on terminal stalks, or from the base of the leaf-stalks, in clusters or solitary, sometimes imperfect, having an involucre of one or several parts, either minute or large, often brightly coloured. The calyx is tubular, coloured, the limb whole or toothed, plaited in the bud, becoming hardened at the base, forming a covering to the seed, the limb falling off. The stamens are of definite number, attached to the base of the ovary, sometimes on one side. The anthers are two-celled. The ovary is above the calyx, with a single erect ovule; the style single, the stigma simple. The fruit is thin, enclosed within the persistent base of the calyx; the seed is destitute of the usual covering, the base of the calyx cohering to it; it contains farinaceous albumen.

This Tribe has close affinity with *Amarantaceæ* and *Chenopodiaceæ*, but is distinguished from both by the base of the calyx becoming a tough covering to the seed.

The roots of several species possess medicinal properties.

Mirabilis is the usual Latin appellation of the genus which is the type of this Tribe, but French botanists still prefer the name *Nyctago*, given it by Van Royen, and adopted as the designation of the plants generally, in allusion to their night-blowing. Clusius named it *Admirabilis*. *Mirabilis Jalapa* (1) is the most frequent example of the genus in our gardens, having been introduced before the close of the 16th century; the large tuberous roots were formerly supposed to yield the true medicinal Jalap, but that opinion has been long since found to be erroneous. The flowers by cultivation acquire varied colours, which renders it a pleasing ornament to the border. *M. longiflora* (2) was not brought to England till 1759, and is a less hardy species, not flourishing in all soils, but it is a very desirable annual

1. *Mirabilis Jalapa*, *Marvel of Peru*.

West Indies.

1A *Section of Flower*.

2. *Mirabilis longiflora*, *Fragrant Marvel of Peru*.

Mexico.

2A *Hair, magnified*.

2B *Involucre and Seed*.

2C *Seed*. 2D *Section*.

3. *Abronia mellifera*, *Honey-scented Abronia*.

California.

3A *Stamens and Pistil*.

3B *Fruit*. 3C *Seed*.

4. *Pisonia obtusata*, *Obtuse-leaved Pisonia*.

South America.

4A *Flower, magnified*.

4B *Stamens and Pistil*.

4C *Cluster of Fruit*.

NYCTAGINACEÆ.

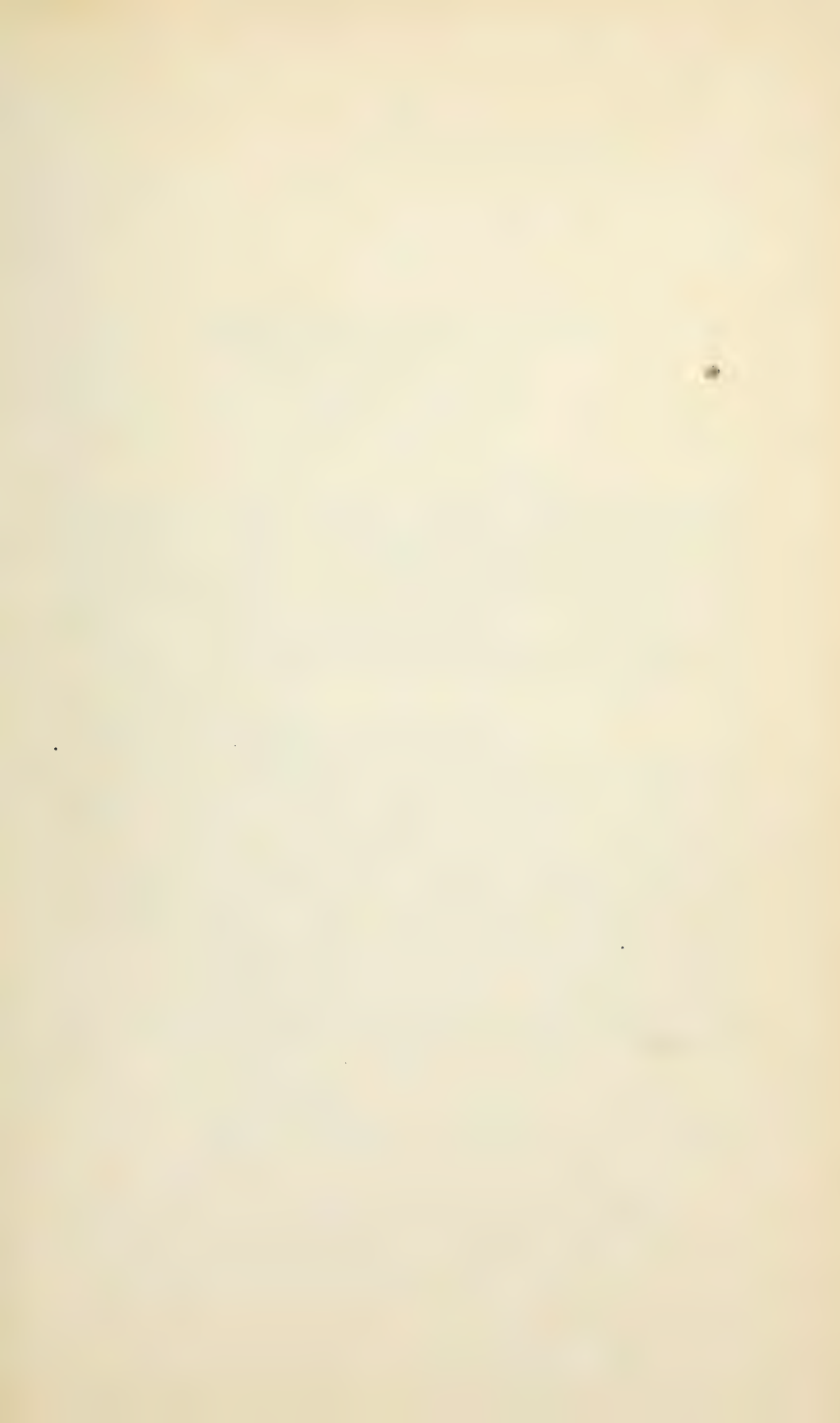
plant, from the extreme fragrance of its delicate flowers, which expand about sunset and wither before sunrise, so fragile is their texture. The long tube is clothed with glutinous hairs by which small insects are detained; the roots are powerfully medicinal. *M. dichotoma* of the West Indies opens its flowers in the afternoon, and is called by the French *fleur de quatre heures*. *M. suavolens* is a medicinal plant much employed in Mexico as a cure for rheumatism; the scent resembles that of Anise. Although many species of *Mirabilis* are admired for their beautiful and fragrant flowers, others are of very insignificant aspect and rank amongst mere weeds. The seeds of some contain so large a portion of farinaceous albumen, as to afford a supply of food to the Japanese: they have also the art of extracting a colouring pigment from them. *Abronia* is a genus of no known use, yet with delicate pretty flowers. *A. mellifera* (3) is found in the northern parts of California, in 46° of north latitude, and 12° of west longitude; it was first discovered by David Douglass, near the Great Falls of Columbia, and is abundant on the dry, sandy deserts of the interior of the country, never seen on the sea-shore, where grow *A. umbellata* and *A. arenaria*. The stem and flower-stalks are slightly glutinous, like those of several species of *Mirabilis*; the flowers have the scent of honey in the evening, which is the usual time of perfection for these plants. The involucre of *A. umbellata* is of a bright pink colour, which gives a singular effect to the flowers. *Pisonia* is a genus of evergreen shrubs named after Piso of Amsterdam, who wrote on the Natural History of Brazil, 1648. *P. obtusata* (4) offers a striking contrast to the herbaceous plants of this Tribe, being perennial in its nature, of stiff foliage and minute inflorescence of no beauty of colour. The seed is covered with a soft pulpy substance that is considered eatable in its native country. The roots contain medicinal properties. *P. aculeata* belongs to the East and West Indies, is very common in Jamaica and St. Domingo. The spines are awl-shaped, with a recurved sharp point, they grow at the base of the leaf-stalk, perpendicular to the branch, and cause much inconvenience to travellers, sometimes nearly preventing their passage through woods, by arresting their garments. The fruit, covered with small glutinous points, clings fast to everything that comes near to it, and frequently encumbers birds on their flight by sticking to their wings. *P. inermis* is a native of the Island of Carthagenæ. *Boerhaavia* was so called in honour of the famous botanist of Leyden, who died 1758, the first friend and patron of Linnæus. *B. hirsuta* and *B. procumbens* have both medicinal properties. The root of *B. decumbens* is called hogmeat in Jamaica, and is used as an emetic in Guiana like *Ipecacuanha*. *B. diffusa* and *B. repanda* grow almost everywhere in India. *B. viscosa* is a climbing plant of Peru; *B. scandens* of Jamaica. *Bugainvillea*, recording the name of a celebrated traveller, is also of a climbing habit, with large rose-coloured bracts in the conical clusters of flowers.

This Tribe exists chiefly in the Tropics, scarcely extending far beyond them, except *Abronia* in North America, and *Boerhaavia* in the Southern Hemisphere.

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Amarantaceae
The Amaranth Tribe





AMARANTACEÆ.

THE AMARANTH TRIBE.



SHRUBS and herbs; the leaves are simple, opposite or alternate, without stipules. The flowers grow in heads or spikes, not always containing both stamens and pistil. The sepals are three or five, placed below the ovary, usually membranous, and coloured, sometimes herbaceous; distinct or united at the base, all equal, or an outer one dissimilar, often surrounded by dry, coloured bracts. The stamens are fixed at the base of the ovary, either five and opposite the sepals, or twice or thrice the number; either distinct or united; the anther one or two-celled. The ovary is single, free, containing one or a few ovules hanging from a central thread. The fruit is a membranous bag or a berry; the seeds are pendulous, and contain farinaceous albumen.

These plants have close affinity with *Chenopodiaceæ*.

Wholesome mucilaginous properties exist in the leaves.

Amarantus is a name derived from the Greek, expressing its permanent nature and colour, many of the flowers retaining their bright colouring long after being gathered. The genus is dispersed in different proportions in each quarter of the world. *A. Blitum* (1) is the only British species, small in size, and of no beauty of colour; a striking example of the lowly form of a genus on the limits of its station, which in a more genial and favourable climate is developed into superior size and brilliancy of colour. It is to be seen chiefly in boggy ground, near Cambridge and elsewhere. The seed is solitary, black, and shining. In this country it is considered a mere weed, but in some parts of France it is cooked and eaten by the poor peasants; for, like others of this Tribe, it contains a mild mucilaginous juice. *A. caudatus* (2) is an old favourite in the garden, having been introduced from the East Indies before the close of the sixteenth century. This and other species produce a large supply of seeds, which share in the durable nature of the flower, and preserve the power of germination many years. *A. frumentaceus* is cultivated for

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| 1. <i>Amarantus Blitum</i> , <i>Wild Amaranth</i> . | England. |
| 1A <i>Flower with Stamens</i> . | |
| 1B <i>Flower with Pistil</i> . | |
| 1C <i>Seed-vessel</i> . | |
| 2. <i>Amarantus caudatus</i> , <i>Love lies Bleeding</i> . | East Indies. |
| 2A <i>Flower</i> . | 2B <i>Stamens</i> . |
| | 2C <i>Seed</i> . |

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| 3. <i>Celosia cristata</i> , <i>Crested Cock's-comb</i> . | Asia. |
| 4. <i>Gomphrena officinalis</i> , <i>Officinal Gomphrena</i> . | Brazil. |
| 4A <i>Flower and Bracts</i> . | |
| 4B <i>Calyx</i> . | 4C <i>Pistil</i> . |
| 4D <i>Flower open</i> . | 4E <i>Seed</i> . |
| 5A. <i>Flower of C. longifolia</i> . | |
| 5B <i>Stamens</i> . | 5C <i>Section of Seed</i> . |

the sake of the seeds, like corn, in the Mysore country; *A. Anardhana* on the Himalayas for the same object. The species known as *Prince's-feather* is stiff and erect, but some are of more graceful form and very ornamental. Others are serviceable as food, and afford a wholesome supply; *A. oleraceus*, to the natives of Guinea, China, and similar hot countries. *A. viridis* is among the eatable herbs of the East Indies. Some are used medicinally; *A. debilis* is one of the medicinal species of Madagascar. *Celosia cristata* (3) is a remarkable plant of annual growth, attaining a wonderful development by cultivation and care; in Japan it is frequently to be seen, with the expanded flower-stalk covered with its countless minute flowers, as much as a foot in length and breadth. It is considered to have medicinal properties in India, where it is indigenous, as well as in China. *C. margaritacea* is found at moderate elevations on the Suen range of mountains. *Gomphrena officinalis* (4) is of high repute in its native country, supposed to be a remedy for all diseases, and the bite of snakes; *G. macrocephala* possesses similar properties, and the roots are tonic. *G. globosa* has been long known in our conservatories as the Globe Amaranth: the bright purple flowers remaining unwithered during many months. *Achyranthes* is a genus with dry membranous flowers of no particular beauty of form or colour, excepting *A. porrigens*, which has round heads of crimson flowers. *A. globulifera* of Madagascar is employed as a medicine. *A. aspera* and *A. fruticosa* are among the various medicinal plants used by the natives of India. *Achyranthes* inhabits also Norfolk Island, and extends into Europe as far as Sicily. Many of this tribe grow on the plains of India; some are traced along the base of the Himalaya, ascending to moderate elevations. *Chamissoa*, *Alternanthera*, *Pupalia*, and others, belong equally to America. *Digera* is common in India, and grows likewise in Arabia and Egypt. *Deeringia* is a native of India and Australia; *Desmochetia* spreads northwards in India, and is found also in Java and the Isle of Bourbon. *Allmannia* is scattered over the isles of the Indian Archipelago, and in Singapore. *Cladostachys* and *Centrostachys* are natives of Nepal. *Polyscalis* is peculiar to the mountains of India, flourishing at a higher elevation than any other plant of this tribe; *P. sequax* and *P. capitata* having been seen between 7000 and 8000 feet. *Oplotheca floridana* is a stiff, erect plant, bearing spikes of small white flowers, a native of Florida.

This Tribe is most abundant in the Tropics, especially of America, gradually diminishing in Temperate regions, unknown in the coldest countries; five species only belong to Europe. It is found in various localities, on plains and mountains, dry barren situations, salt marshes, or woods.

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Chenopodium

rose-footed rose

CHENOPODIACEÆ.

THE GOOSE-FOOT TRIBE.

UNDER-SHRUBS and herbaceous plants, some of which are climbing; sometimes having jointed stalks. The leaves are alternate, occasionally opposite. The flowers are small, sometimes the stamens and pistil are in separate flowers. The calyx is deeply divided, sometimes rather tubular at the base; in *Basella* the sepals form two rows; the stamens are inserted into the base of the calyx, opposite its segments and equal to them in number, or fewer. The ovary is single, above the calyx, or sometimes adhering to the tube of the calyx. The styles are two or four, rarely single, the stigmas undivided. The fruit is membranous, sometimes a kind of berry is formed by the succulent calyx; the seed contains either a flat spiral embryo in albumen, or a conically spiral one without albumen.

This Tribe has affinity with *Amarantaceæ* and *Phytolaccaceæ*, but is distinguished by the number and position of the stamens.

Many of these plants contain soda, others sugar, in the root.

Chenopodium, from the Greek for *goose-foot*, is a genus very frequent in Europe, usually on waste ground, or on heaps of rubbish, where *C. bonus Henricus* (1) is to be found. This species was formerly cultivated in gardens, and eaten as a vegetable; the mucilaginous leaves are still, in country places, thought good for healing slight wounds. *C. olidum* also affords wholesome food. *C. maritimum* may be preserved as a pickle; when burned it produces soda, like several other plants of this tribe. *C. quinoa* of Peru is one of the common eatable herbs of that country; its seeds contain wholesome farinaceous matter. The shape of the leaf varies in different species, but they are all more or less of a triangular form; and that of *C. bonus Henricus* sufficiently justifies the choice of the generic name, resembling as it so nearly does the webbed foot of a goose. *Beta* (2), from the

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| 1. <i>Chenopodium bonus Henricus</i> , <i>Goosefoot</i> , or
Mercury. England. | 4. <i>Basella rubra</i> . East Indies. |
| 1A Ovary and Styles. 1B Seed. | 4A Sepal and Stamen. |
| 1C Flower of <i>C. album</i> . | 4B Stamen. 4C Ovary and Styles. |
| 1D Section. 1E Section of Seed. | 4D Section of Ovary. 4E Fruit. |
| 2. <i>Beta maritima</i> , <i>Sea Beet</i> . Shores, England. | 5. <i>Blitum virgatum</i> , <i>Strawberry Blite</i> .
South Europe. |
| 2A Flower. | 6A. Flower of <i>Salsola Kali</i> . |
| 3. <i>Spinacia oleracea</i> , <i>Spinage</i> . South Europe. | 6B Spiral embryo. |
| 3A Stamen flower. | 7A. Spike of <i>Salicornia herbacea</i> . |
| | 7B Flower, magnified. |

CHENOPODIACEÆ.

old Celtic word for *red*, has long yielded a good supply of nutritious food in its root, enlarged by cultivation, but is of late years become of greater importance to man for the sugar obtained from two species. *B. vulgaris* of the south of Europe is the common Beet-radish, eaten both raw and cooked, used as a pickle, and as a substitute for coffee, now affording excellent sugar from the root: a fine varnish may also be made from it. *B. cicla* is extensively grown in Germany, France, and Switzerland, the large leaves are used for soups. *B. maritima* (2) is a native of many parts of our south coast; its succulent nature renders it eatable as a herb, but the root is small, black without, pale within. Although the power of manufacturing sugar in so northern a country as France is considered of great value, yet the most important use of Beta is in the enormous root of Mangel-wurzel, as winter food for cattle. Spinacia (3) has the stamens and pistil in separate flowers; it has been a constant herb in English gardens for nearly three centuries; being very hardy, it is sown in the early spring, and affords a plentiful supply of its leaves, which have a pleasant sub-acid flavour. Basella (4) is the name of the plant in Malabar; it is much cultivated in the East Indies and China, and is also amongst the various vegetables which the French esteem and use more abundantly than the English. *B. tuberosa* of Quito has a large fleshy root. Blitum (5) is said to derive its name from the Celtic for insipid; the calyx enlarges and becomes succulent, enclosing the seeds, the whole cluster having at last the aspect of a strawberry. Salsola Kali is one of the valuable plants yielding in its ashes a large supply of soda; it grows on the sea-shore of temperate countries, and is easily recognised by its prickly-pointed leaves and three spiny bracts of the flowers (6). *S. soda* abounds on the coasts of Spain, and forms *barilla*. *S. sativa* yields the best soda, now very extensively used in the manufacture of glass and soap, and for a variety of other purposes. The name Salicornia denotes its saline nature and horned calyx, which enlarges as the seed ripens, forming a covering to the seed-vessel. *S. herbacea* (7) is common on the river shores of our east coast, where it is known as marsh Samphire, and made into a pickle. The silvery grey Atriplex is found throughout Europe, in salt marshes, on mud shores, on heaps of rubbish, and other rough places. One species of this apparently mean and despicable genus affords wholesome food; *A. hortensis* is cultivated extensively in gardens around Paris. *Acnida cannabina* is the Virginian hemp of N. America. Thelygonum *cynocrambe* abounds in slender saline crystals; it has medicinal properties, and is also occasionally eaten.

This Tribe inhabits waste places in all parts of the world, most abundant in Temperate regions, frequent in salt marshes. Basella belongs to the Tropics.

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Rubus fruticosus
Rubus fruticosus

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PHYTOLACCACEÆ.

THE PHYTOLACCA TRIBE.

UNDERSHRUBS and herbaceous plants; the leaves are alternate, entire, without stipules, often having transparent dots. The flowers are in racemes, perfect, regular, or partly irregular, arranged in various ways. The calyx is composed of four or five sepals; sometimes having the appearance of true petals, which are wanting. The stamens are fixed below the ovary, equal in number and alternate with the sepals, or of indefinite number. The anthers are two-celled, opening lengthwise. The ovary is of one carpel, or several, distinct, or partially combined; the styles and stigmas are equal in number to the carpels. The fruit is dry or a berry, closed. The seed is solitary, and contains mealy albumen.

This Tribe is connected with *Chenopodiaceæ* and *Polygonaceæ*.

Acrid properties exist in various intensity in these plants.

Phytolacca signifies a plant yielding a red lac colour, which the berries of *P. decandra* (1) do abundantly. It was the first species known in this country, having been introduced from Virginia early in the seventeenth century: the English name of Poke is derived from the Virginian Pocan. No use is made of it here, but it is very ornamental, both in flower and fruit; graceful in form, and brilliant in hue. The juice of the berries has strong medicinal properties, and a spirit distilled from them is poisonous to animals; nevertheless, poultry feed eagerly on the fruit, without injury. In the United States, the young shoots, which sprout forth in great profusion in a rich soil, are eaten, and considered excellent; the acrid properties being expelled by boiling. The root is large and branching, and when dried and pounded, is very similar in its effects to *Ipecacuanha*. If permanence could be given to the purple colouring matter, it might be valuable for staining paper or other materials. Since the introduction of the plant to the countries bordering the Bosphorus, it has been employed to give a bright colour to sherbet. It is said, also, that in Portugal the berries are extensively used to colour port wine; but they are not so wholesome for that purpose as those of the elder, which were some years ago forbidden by the government as an unlawful adulteration, and the bushes were all cut down. *P. acinosa* is one of the medicinal

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| 1. <i>Phytolacca decandra</i> , <i>Virginian Poke</i> . | |
| North America. | |
| 1A Flower. | 1B Flower. |
| 1c Ovary and Pistil. | |

- | | |
|----------------------|----------|
| 1D Section of Ovary. | 1E Seed. |
| 1F Section of Seed. | |

- | | |
|---|---------|
| 2. <i>Rivina tinctoria</i> , <i>Dyer's Rivina</i> . | Brazil. |
|---|---------|

PHYTOLACCACEÆ.

plants of the Himalayas. *P. drastica* of Chile has a root shaped like a turnip, which is said to contain very powerful properties.

Rivina was named after a Saxon, who was for many years professor of botany and medicine at Leipzig, and published several valuable botanical works; some of his ingenious and original remarks on the distinguishing characters of the corolla of plants, have been incorporated by other authors in their writings. Rivina being a genus continually producing flowers and fruit, is a perennial honour to his memory and talents, as Linnæus remarked. *R. tinctoria* (2) is one of the numerous plants yielding colour in Brazil. It is of very elegant growth, and a pleasing ornament to the conservatory. The fruit contains one rough seed; the colouring substance of the pulp is a bright red. *R. octandra* abounds in Jamaica, and furnishes hoop-bands for sugar-casks, from its long, tough, and flexible stalks. The berries, which contain an oily seed, are the chief food of the American Thrush; but, as they are heavy of digestion, it is said that the bird, with true instinct, immediately seasons its repast with a few pods of the *Capsicum baccatum*, the Bird-pepper bush. The species are generally upright, but *R. octandra* is of a climbing nature, and twenty feet high. The seeds of the Rivina have only a small portion of albumen. Giesekia, with its separate ovaries, forms a link with Chenopodiaceæ. From the experiments of French chemists, it has been shown that the ashes of *Phytolacca decandra* contain a very large proportion of potash; the cultivation of it, therefore, in France, might probably be advantageous as a source of alkali.

Some species of this Tribe are natives of North and South America, in the Tropical regions, and beyond them: others belong to India and Africa. *Phytolacca decandra* has become naturalized in some Southern countries of Europe.



BEGONIACEÆ.

THE BEGONIA TRIBE.

SUCCULENT undershrubs, or herbaceous plants, having an acid juice. The leaves are alternate, toothed at the edges, rarely entire, usually unequal at the base. The stipules are large and membranous. The flowers are pink or white; the stamens and pistils are in separate flowers on the same plant. The calyx is adherent to the ovary, coloured like a corolla; in the stamen flower the sepals are four, two smaller, and within the other two; in the pistil flower the sepals are five, two of them smaller. The stamens are of indefinite number, either distinct, as in *B. semperflorens* (1), or combined into a solid column. The anthers united into a head, two-celled, continuous with the filament; the connective between the two cells of the anther remarkably large, the cells minute, bursting longitudinally. The ovary is adherent, winged, three-celled, the stigmas are three, two-lobed, placed on the ovary, and somewhat spiral. The fruit is a membranous winged capsule, three-celled, containing numerous small seeds, bursting by slits at the base of the wings. The seeds are netted, and have no albumen.

These plants have much resemblance to Polygonaceæ, in the calyx and seed-vessel.

Astringent and slightly bitter properties exist in the roots.

Begonia was named after a French botanist of the 17th century; there are many species, all of a more or less succulent nature. The leaves are generally of glossy texture, and bright in colour, some very red, others covered in parts with red fringes, usually having one side much larger than the other. The flowers are curious in form, produced in great abundance throughout the summer, and very ornamental in conservatories. *B. semperflorens* (1) is a very graceful species, the delicate white flowers have the stamens with distinct filaments, and come forth plentifully in spring. *B. diversifolia* (2) is one of the brightest species of Mexico. *B. sanguinea* (3) is much admired for its singular foliage, of a tougher substance than usual, showing very remarkably the unequal sides of the base of the leaves, as well as the difference of colour between the upper and under surface. It grows to a

1. *Begonia semperflorens*, *White-flowered Begonia*. Brazil.

1A *Pistils and Ovary*.

1B *Pistil*. 1C *Stamen*.

1D *Capsule, showing Seeds*.

2. *Begonia diversifolia*, *Various-leaved Begonia*. Mexico.

3. *Begonia sanguinea*, *Red-leaved Begonia*.

Brazil.

4. *Begonia manicata*, *Fringed Begonia*.

Brazil.

5A. *Stamen of Diplocinium Evansianum*.

5B *Cross-section of the Ovary*.

5C *Seed*.

BEGONIACEÆ.

greater height than some others, and is very beautiful. *B. manicata* (4) is an example of the fringed species, the flowers are small, but the leaves attain a large size. *B. argyrostigma*, of Brazil, is a singular species, the leaves being spotted with white; the green colouring matter not flowing in certain cells causes little rings of pure white to appear on the upper surface, a small green point remaining in the midst, the under surface of the leaf is red. *B. discolor*, of China, has mottled leaves, which make a pleasing variety. Although in Europe the Begonias are only esteemed for their beauty, yet in their native countries several of them are valued by the inhabitants for medicinal qualities, or as food. The leaves of *B. barbata*, called *tengoor*, are eaten by the people who dwell in some of the valleys of the Himalaya. *B. tuberosa* and *B. malabarica* are also thought eatable in some parts of India. The root of *B. grandiflora* and of *B. tomentosa* are bitter and astringent; in Mexico several species are considered to have medicinal properties; others are employed in Peru. These plants require the heat and moisture of a tropical climate for their development, but some extend as far as 30° of north latitude, finding a suitable atmosphere on the mountains of Northern India, at an elevation in some districts as high as 7000 feet, where during the rainy season the moisture is extreme. *B. echinata*, *B. picta*, and *B. cordata*, all belong to the Himalaya. *Eupetalum* and *Diploclinium* are the only other genera of this tribe; the latter consists merely of those Begonias which have a double plate for the seeds in the ovary. The cultivation by seed is easily effected in this country. Some species have been discovered of a climbing habit, reaching to the height of twenty-five feet; this appears to form a link with Cucurbitaceæ.

These plants are very common in the East and West Indies, and in South America. None are known in Africa, but some are found in Madagascar and the Isles of France and Bourbon.



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POLYGONACEÆ.

THE BUCK-WHEAT TRIBE.

HERBACEOUS plants and a few shrubs. The leaves are alternate, with scarious stipules cohering round the stem, occasionally wanting. The flowers are in racemes, occasionally solitary; the stamens and pistil are sometimes in different flowers. The corolla is wanting, the calyx often coloured and assuming the appearance of petals, from three to six-parted. The stamens are usually of definite number, and placed on the bottom of the calyx; the filaments are free and straight, the anthers opening lengthwise. The ovary is of one cell, formed by the adhesion of three carpels; the styles or stigmas of the same number as the carpels. The fruit is a nut, either naked, or partly covered by the enlarged calyx, or wholly enclosed in it, as in *Coccoloba*. The seed is single, and contains farinaceous albumen.

This Tribe has affinity with *Chenopodiaceæ*; *Eriogonum* forms a link with *Nyctaginaceæ*, having no stipules.

Agreeable acid qualities exist in the leaves and stalks, nauseous medicinal properties in the roots; some of the plants are also powerfully astringent.

Polygonum, so called from the many joints of the stem, is a genus widely scattered over all Temperate countries, attaining higher development of size and colour in hotter climates. *P. Persicaria* (1) is common in ditches and watery places, growing to two feet in height; having a fibrous root, occasionally sending out rootlets from the joints. *P. amphibium* is the finest British species; raising its numerous erect spikes of pink flowers above the water, the stem spreads to a considerable extent, roots proceeding from all the joints. It is almost impossible to extirpate it; even from alluvial land, drained for many years, it will continue to spring up. It is said that waterfowl eat the seeds. *P. hydropiper* is very generally to be seen in ditches; the whole plant is covered, more or less, with glandular pores, containing an intensely acrid juice, from whence it was named Water-

1. <i>Polygonum Persicaria</i> , <i>Spotted Persicaria</i> . England.	2E <i>Section of Seed</i> .
1A <i>Flower</i> . 1B <i>Seed</i> . 1C <i>Section of Seed</i> .	3. <i>Rheum spiciforme</i> , <i>Spiked Rhubarb</i> . Himalayas.
2. <i>Polygonum orientale</i> , <i>Eastern Persicaria</i> . East Indies.	3A <i>Flower</i> . 3B <i>Section of Ovary</i> .
2A <i>Flower opened</i> . 2B <i>Cluster of Flowers</i> . 2C <i>Stamen</i> . 2D <i>Ovary</i> .	4. <i>Coccoloba uvifera</i> , <i>Sea-side Grape</i> . West Indies.
	4A <i>Flower</i> . 4B <i>Pistil</i> . 4C <i>Seed-vessel</i> . 4D <i>Seed</i> .

pepper. The long slender spike of small greenish flowers distinguishes it from other species. *P. aviculare*, Knot-grass, is one of the most frequent of weeds, growing almost everywhere, in waste and cultivated ground, the prostrate stems spreading their numerous branches in every direction. The angular black seeds furnish an abundant supply of food to small birds. *P. Convolvulus* is a climbing species, usually to be found in osier grounds. *P. orientale* (2) is the Persicaria of our gardens, having been brought from the East in the beginning of the eighteenth century; it is often as much as ten feet in height, far surpassing the British species in size and beauty. Several species in Brazil, as well as in India, are valuable to the natives for their medicinal properties. *Egopyrum esculentum* has been made a distinct genus from Polygonum, and is the most important of the Tribe, yielding a large proportion of wholesome nourishment in its farinaceous seeds. Originally a native of the East, it has become naturalized here, and often appears in corn-fields. As food for pheasants, it is cultivated in some parts of the country; but in Belgium it is much grown, and the flour obtained from the seeds is made into cakes; it is a remarkably beautiful crop, the bright red stalks bearing their graceful spikes of pink and white flowers. In North America it is still more generally used for cakes: English crumpets are no longer made of Buck-wheat, as formerly.

Rheum is said to have derived its name from *Rha*, the ancient name of the Volga, on the banks of which the famous root was discovered in abundance. *R. palmatum* is the species from whence the chief supply is obtained on the mountains in Tartary; in China, also, the plant is much cultivated; the roots are generally taken up twice in the year, stripped of their bark, and dried in the air. *R. spiciforme* (3) grows on the northern slopes of the Himalayas; the roots are of compact texture and light colour, and possess the usual properties. *Coccoloba uvifera* (4) grows in the estuaries of salt water or on sandy shores in South America and the Isles of the Caribbean Sea: saline particles are essential to its perfect development, for whenever it is found in an inland situation it produces only leaves, no flowers. The French colonists call it *Raisin du bord de la mer*; the enlarged calyx entirely encloses the seed, and forms a pulpy fruit, in appearance like grapes, of an agreeable sub-acid flavour. The trees are tall and branching, the wood is hard and heavy, but of little use; when boiled, it imparts a red tint to water. *C. excoriata* is found by the side of torrents in St. Domingo; this species, and also *C. obtusifolia*, exhibit close affinity to Polygonum, the pink calyx not wholly enclosing the black seed, nor becoming so pulpy as in *C. uvifera*. Several other species are natives of the West Indies. Rumex contains some troublesome weeds, as docks, and some eatable herbs much used in Continental cookery. *R. scutatus* is the French Sorrel, of pleasant acidity; *R. acetosa*, an English species, the common Sorrel; the astringent roots yield a red dye. *Oxyria reniformis* has strong acid qualities in the leaves; it grows chiefly in northern situations in various parts of Scotland, and extends far north into the Arctic regions. *Calligona Pallasia* is a leafless shrub on the Steppes of Siberia, affording food to the Calmuck peasants in the fruit and roots. Among the eatable fruits of Eastern Australia described by Mr. Backhouse, is *Muhlenbeckia adpressa*. Sir Robert Schomburgk found the stem and branches of *Triplaris americana* full of hollow cells, which serve as habitations for ants.

This Tribe is scattered over the world in nearly every part: Polygonum and Rumex abounding in Temperate regions; Coccoloba in South America and the West Indies; Oxyria existing in the dreary regions of the North Pole.

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111
Lauraceae
The Laurel Tree



L A U R A C E Æ.

THE LAUREL TRIBE.

TREES, some of which are of large size. The leaves are alternate, seldom opposite, entire at the edges, or rarely lobed, without stipules. The flowers are small, and grow in panicles or umbels, or small clusters. The calyx is four to six-cleft, petals are wanting; sometimes the stamens and pistil are not perfect in the same flowers. The stamens are of definite number, placed on the calyx, usually twice as many as its segments, and opposite to them. The three innermost stamens are imperfect; the six outer have perfect anthers, which are two to four-celled, the cells bursting by a long persistent valve, opening upwards. The inner filaments usually have glands at their base. The ovary is above the calyx, one-celled, with a simple style, and stigma, either obtuse or two or three-lobed. The fruit is either a berry or a drupe, naked or covered, its stalk often becoming enlarged (4). The seed has no albumen.

This Tribe is chiefly distinguished from Thymelacæ and others by the reflexed valves of the anthers.

Aromatic properties, oil and camphor, exist abundantly in these trees.

Laurus, derived from the Celtic *laur*, green, is a genus with evergreen leaves, existing in the East and West Indies, and more abundantly in North America. It yields valuable timber in its largest trees, aromatic oil, spice, camphor, and a delicious fruit. *L. nobilis* (1), the only European species, was selected in ancient times as an appropriate plant for garlands to adorn heroes and sages: it was consecrated to the service of priests, and used by them in their sacrifices. The leaves contain aromatic oil, and a small portion of prussic acid, which gives them medicinal power; the fruit when boiled yields also oil. In the southern parts of Hampshire, the Bay grows luxuriantly, and bears a plentiful crop of fruit; but in Italy it attains greater height, becoming a tree. *L. indica*, the Royal Bay, is a native of Madeira and the Canaries, and affords an useful wood for furniture. *L. chloroxylon*, the Cog-wood tree of Jamaica, is sixty feet high; the wood is hard and tough, well adapted for the construction of sugar-mills. One of the most valuable spices is Cinnamon, the

1. <i>Laurus nobilis</i> , Sweet Bay.	Italy.	3. <i>Persea gratissima</i> , Avocado Pear.	
1A Pistil Flower.	1B Stamen Flower.		West Indies.
1C Stamen.	1D Section of Seed.	3A Stamen.	3B Section of Fruit.
2. <i>Cinnamomum javanicum</i> , Japanese Cinnamon.	JAVA.	4A. <i>Dehaasia media</i> .	JAVA.
2A Pistil.		Fruit on enlarged Stalk.	

inner bark of several trees of this tribe : *Cinnamomum javanicum* (2) abounds in Java and the neighbouring isles. In Ceylon, the trees that produce it are so common, that the wood is used for fuel and various purposes. Twice in the year the young branches are cut, the outer bark is scraped off, the thin inner layer carefully loosened. On being exposed to the sun, it curls up into the form we receive it in. The trees have a stunted appearance, not being allowed to grow above nine feet : the delicious scent is not perceptible until the branches are cut, as it is contained in the internal portion of the bark. Cassia bark has nearly similar properties, but is not so fragrant. The Chinese Cassia comes from *Cinnamomum Cassia*. The Clove-cassia of Brazil is the bark of *Dicypellium caryophyllatum*, one of the noblest trees of this tribe, as described by Martius. *Persea gratissima* (3) is the only eatable fruit ; in the West Indies, it is called Avocado, or Alligator Pear ; the pulp is of a sweet, agreeable flavour, but Europeans think it so rich as to require the addition of some kind of spice, or wine. By the negroes it is considered their chief delicacy, and it is eaten by every animal or bird ; the large seed is enveloped in a thin membranous coat. Camphor, a concrete state of oil, is a frequent secretion of this tribe ; a large supply is obtained from all parts of *Camphora officinarum*, which grows plentifully in the Island of Formosa, and being taken in junks to Canton is dispersed thence to various countries. *Sassafras officinarum*, a large tree of North America, yields an aromatic oil from its berries, and the tonic bark is used medicinally. *Benzoin odoriferum* has similar properties. Some of the fruits bear a resemblance to the true Nutmeg, but are of inferior quality. The Clove-nutmegs of Madagascar are produced by *Agathophyllum aromaticum* ; the Brazilian Nutmegs by *Cryptocarya moschata*. The fruit of *Aerodictidium*, or Camara-nutmeg, is highly esteemed in Guiana for its medicinal properties. Among the fever and ague remedies of Guiana, *Nectandra Rodiei*, the Bibiri, is considered the best ; the wood, celebrated for its hardness, is known as the Greenheart of Demerara. *Oreodaphne* is remarkable for a hard yellow wood, with a very disagreeable odour. There occurs frequently one exception in a tribe, which seems to make a link with other plants of very different manner of growth and appearance : *Cassytha* is an example of such a variation from the chief type. It is a slender cord-like leafless plant, resembling most nearly Dodder, and, like that parasitic, bearing small flowers and round white fruit. The structure of the flower, more especially of the stamens with recurved anther-valves, is precisely that of Laurels ; but the fruit differs in being enclosed in the calyx, and becoming a berry. Although not fully conformable to any known Order, it appears to be most rightly placed here.

This extensive Tribe inhabits cool situations in the Tropics ; a few species are found in Madeira, Teneriffe, and Madagascar ; a very few advance northwards into North America ; scarcely any exist in Africa ; one only in Southern Europe. *Cassytha* belongs to the Tropics.

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Myristicaceae.

The Nutmeg Tribe

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MYRISTICACEÆ.

THE NUTMEG TRIBE.

TROPICAL trees, often containing a red juice, the leaves are alternate, without stipules, not dotted, entire at the edges, stalked and leathery. The flowers are small, and grow from the base of the leaf-stalk, or on terminal branches, or panicles. A short folded bract is at the base of the flower; the calyx is leathery, usually downy, three or four notched. The stamens and pistil are in separate flowers, the filaments of the stamens are either distinct or united in a cylinder; the anthers are from three to twelve, two-celled, turned outwards, bursting lengthwise, either united or distinct. The carpels are solitary or many, with a single ovule. The style is very short, the stigma lobed. The fruit is a berry, containing a nut enveloped in an arillus. The seed contains slightly fleshy albumen.

This Tribe has affinity with Lauraceæ and Proteaceæ, but is distinguished by the structure of the anthers and fruit.

Aromatic properties exist generally in the fruit.

Myristica is said to be derived from the Greek for myrrh, in allusion to the aromatic flavour of the fruit. Nutmeg trees, *Myristica moschata* (1), were first cultivated by the Dutch in the island of Banda, but they soon became dispersed throughout the Eastern and Western Tropics, wherever colonies were established by French or English settlers. In the Moluccas and in Sumatra extensive plantations were formed; in the West Indies Trinidad was found to be very favourable for their growth, and in the last tropical territory acquired by English intrepidity and influence, now being subdued by skilful cultivation, in the Sarawak district of the vast island of Borneo, the Nutmeg is considered one of the most valuable objects of attention, and will probably be one of the chief branches of that opening commerce destined to contribute largely to the civilization of the country. The peculiarity of the fruit, which would otherwise be a simple drupe, is the aril or tough leathery covering of the nut, within the fleshy coat of the exterior. This aril, when taken out and dried, is known as mace, a spice of considerable importance for culinary purposes, especially in all hot countries where food requires to be highly seasoned. The nut, or Nutmeg, containing an essential oil of fragrant aromatic odour, and medicinal properties, has a thin black coat, wrinkled by the impression of the aril,

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1. *Myristica moschata*, Common Nutmeg.
Tropics of Asia.
- | | |
|----------------------|-------------|
| 1A Flower. | 1B Stamens. |
| 1C Section of Ovary. | |
| 1D Nutmeg. | 1E Section. |

- | | |
|--|---------|
| 2. <i>Virola sebifera</i> , Oily Virola. | Guiana. |
| 2A Cluster of Flowers. | |
| 2B Stamen Flower. | |
| 2C Pistil Flower. | |

MYRISTICACEÆ.

also an inner skin which adheres closely to the kernel: it is usually employed in a powdered state, both as a condiment and as a medicine. When the fruit is ripe it splits open, showing the red aril within. *M. fatua* is a native of Surinam, with long drooping branches, bearing an oblong fruit, from the kernel of which is extracted a yellow fatty substance used for candles and other purposes of domestic economy; the fragrance of this species is very slight. The bark of this and other species yields an acrid red juice. *M. sphærocarpa* of Martaban has a small round fruit of a bright red colour, with a pale nut within, which, as well as its aril, are aromatic; the fleshy portion of the fruit is acid and astringent. *M. amygdalina* of the same country is nearly similar. *Virola sebifera* (2), a tree of South America, abounds on the borders of forests and hills in Cayenne and Guiana, it attains to 60 feet in height with a top composed of thick twisting branches; the leaves when young are clothed on the under surface with a rusty down. The kernel yields a yellow oily material for making soap and candles, and various uses; the red juice which exudes from the bark wherever incisions are made, is said to be a preservative for the teeth. *Pyrrhosa tingens* of Amboyna has a mace full of red mucilaginous juice, which, when mixed with lime, is used as a pigment. The red juice collected from the trunk of *Myristica spuria* is called Dooghan in the Philippines, and used as a substitute for Dragon's Blood. *Hyalostenma* differs from the true type of this Order in having no aril to the fruit; its numerous carpels make it a kind of link with the Custard-apple Tribe.

This Tribe inhabits exclusively the Tropics of Asia and America, and is most abundant in India.



Banksia laevissima
 (L.f.) R.Br.

PROTEACEÆ.

THE PROTEA TRIBE.

SMALL trees and shrubs, the branches usually in umbels. The leaves are rigid, dry, divided or undivided, opposite or alternate, without stipules, sometimes having pores equally on both sides. The calyx is four-lobed, or four-cleft; petals are wanting. The stamens are four, sometimes part imperfect, opposite the segments of the calyx, and placed upon them. The ovary consists of a simple carpel above the calyx; the style is single, usually very long; the stigma simple. The fruit is gaping when ripe, or closed, and contains one or more seeds which have no albumen.

This Tribe has some affinity with Thymelacææ, but is distinguished by the stamens of the lobes of the calyx, and the gaping fruit.

Very few useful properties exist in these plants; the seeds of some are eatable.

Protea displays considerable varieties in its species, and other genera being of extremely differing aspect, the name is well applied to the whole Tribe. *P. pulchella* (1) is one of the fairest examples in regard to the flower and general aspect, but the character of the Tribe is dull, stiff foliage, and the heads of small flowers afford very little beauty of bright colouring. Like many of the Australian trees and shrubs, a pale dusky hue pervades the leaves, sometimes not only on the under, but also on the upper surface. *P. grandiflora* rises to the size of a tree eight feet high, and is called *Wagenboom* by the Dutch colonists at the Cape, as they use the wood for the wheels of their strong rude carts. The bark is valued for medicinal properties. *P. mellifera* yields a kind of honey in some abundance, which is thought to be a remedy for coughs. The bark of *P. speciosa* is used in tanning leather. Nearly all the genera have been named after learned botanists, Banksia, Lambertia, Persoonia, Dryandra, Hakea, and others, all recording the memory of celebrated men. Grevillea, so called from a nobleman who was a great promoter of natural science, is very abundant in New South Wales. *G. longifolia*

1. *Protea pulchella*, *Wave-leaved Protea*.
Cape of Good Hope.

1A Flower with Pistil.

1B Stamen.

1C Three Stamens.

2. *Grevillea longifolia*, *Long-leaved Grevillea*.

2A Flower of *G. linearis*. Australia.

3. *Telopea speciosissima*, *Waratah*.

3A Pistil. New South Wales.

3B Calyx and Stamens.

3C Anther.

4. *Leucospermum hypophyllum*, *Trifid-leaved Leucospermum*. Cape of Good Hope.

5. *Banksia media*. New Holland.

6. *B. speciosa*. Fruit.

- 7A. *Hakea acicularis*.

7B Fruit. 7C Seed.

- 8A. *Hakea undulata*. Seed-vessel.

PROTEACEÆ.

(2), is an elegant species when in flower, the extremely long styles bent backwards, giving a singular effect to the flower-spike. *Telopea speciosissima* (3), is of a brilliant colour and considered ornamental in the conservatory, although seldom seen in its full vigour; it is best known by its native name of Waratah. *Leucospermum* is named from the whiteness of the seeds; the shrubs are usually downy or hairy, and the heads of flowers stand erect at the ends of the branches. The leaves of *L. hypophyllum* (4) have, like those of other species, a few strong notches at the end of the leaves. This is peculiarly a Cape genus, and some of the species were amongst the first importations we obtained from that settlement in 1774. *Banksia* was named by Linnæus in honour of his friend Sir Joseph Banks, who, although younger, had already attained to great eminence as a naturalist. It is an Australian genus of noble aspect, and has the peculiar character of bearing the produce of four years on the tree at the same time: the dry hard seed-vessels of the two previous years, the cone of expanded flowers of the present season, and the buds of the future year. *B. media* (5) is a fine shrub in our conservatories, but all these shrubs can only flourish in a spacious airy building, a moist atmosphere is very uncongenial to their nature. *B. speciosa* (6) bears a large cone-shaped fruit, which seems to form a kind of link with the Fir Tribe, as also does the rigid foliage: the two-valved capsule gapes when ripe. *B. grandis* is said to attain a great size on the barren hills on the banks of the Swan River; some trees have been found fifty feet high, and more than two and a half in diameter. *Dryandra* is a very similar genus, the leaves are all more or less clothed with fine white down on the under surface, and the bracts of the flowers extremely silky. *D. plumosa* has a remarkably delicate pinnated leaf, the small triangular leaflets tipped with a fine point. *Hakea* is a shrub with very stiff foliage, the seed-vessel (7) is a follicle of a woody nature, containing two winged seeds. *H. undulata* bears a large seed-vessel, and has wavy prickly-toothed leaves. Amongst these shrubs very few afford food of any kind; the seeds of *Brabejum stellatum*, the *African almond* of the Cape, when roasted are eaten like chesnuts, and their outer covering is used as coffee. The nut-like fruit of *Guevina* is sold in the markets of Chile. The flowers of *Persoonia macrostachya* and *Petrophila brevifolia* yield a bright colour when boiled, which might doubtless be available for dyeing. *Lomatia*, *Stenocarpus*, *Nivenia*, and several others, are natives of the Cape of Good Hope.

This Tribe is most abundant at the Cape, and in Australia. A few species only belong to South America, and the Isles of the Malay Archipelago. In the Northern Hemisphere *Protea abyssinica* and *P. Paulina* are almost the only examples.



Symphoricarpos

Dochna

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THYMELACEÆ.

THE DAPHNE TRIBE.



SHRUBS with tenacious bark, and a few herbaceous plants. The leaves are alternate or opposite, without stipules, and entire at the edges. The flowers are in heads or spikes, at the ends of the branches, or at the base of the leaf-stalks, occasionally solitary, often enclosed in an involucre. The calyx is below the ovary, tubular, coloured, the top usually four-cleft, generally imbricated in the bud. The corolla is either wanting, or consists of scale-like petals in the mouth of the calyx. The stamens are of definite number, usually eight, or four, opposite the segments of the calyx; the anthers are two-celled, bursting lengthwise in the middle. The ovary is composed of a single carpel, the style is simple, the stigma undivided. The fruit is hard, dry, and nutlike, or a drupe; the seed is single, and has thin or fleshy albumen, or none.

This Tribe has affinity with Proteaceæ and Elæagnaceæ, and is chiefly distinguished by the position of the anthers.

Extremely caustic juices exist in the bark of these shrubs.

A Spanish species of *Daphne*, *D. thymelea*, was chosen to give a name to this Tribe. *D. mezereum* (1) is a native of English woods, and has long been an admired shrub in gardens, from the precocity of the fragrant flowers, coming forth on the branches in the first dawn of spring, while the leaf-buds are only beginning to unfold at the top. The delicate beauty of this and other spring flowers is duly appreciated in the early season of the year, whilst the specimens of the floral world are yet scarce. It grows in all parts of Europe, from north to south. The roots are large and branching, and are supposed to be a remedy for toothache; the acrid bark and berries are used for blisters in France. *D. laureola* (2) will flourish under the shade and dripping of trees, and is therefore valuable in a shrubbery: the roots have similar properties to those of *D. mezereum*, but are black when ripe instead of red; they are poisonous to all animals except birds, who eat them greedily as soon as they are ripe. The bark of the stem and branches is extremely tough, as is that of nearly all this Tribe. From the inner bark of *D. Bholua* a very soft

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| 1. <i>Daphne mezereum</i> , <i>Mezereon</i> . | |
| | Woods, England. |
| 1A Flower, opened. | |
| 1B Stamen. | |
| 1C Section of Ovary. | 1D Seed. |

2. *Daphne laureola*, *Spurge Laurel*. England.

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| 3. <i>Dais laurifolia</i> , <i>Laurel-leaved Dais</i> . | |
| 3A Pistil. | Cape of Good Hope. |
| 4. <i>Dirca palustris</i> , <i>Leather-wood</i> . N. America. | |
| 5. <i>Pimelea spectabilis</i> , <i>Showy Pimelea</i> . | |
| 5A Flower. | Swan River. |

- 6A. *Lagetta lintearia*, *Lace-bark*. Jamaica.

kind of paper is made in Nepal. The most remarkable example of inner bark is that of *Lagetta lintearia*, the vegetable lace-tree (6); it consists of many layers of interlaced silky fibres, forming a thin netted substance, which may be stripped from the wood and extended to a considerable size, sometimes three or four feet in length. Charles II. received as a present, from the Governor of Jamaica, a cravat, frill, and ruffles, made of this lace-bark. *D. odora* is a white-flowered species of Japan; *D. acuminata* grows in Persia and Beloochistan above four thousand feet elevation; it is excessively unwholesome for cattle. *D. pontica* is one of the plants which imparts injurious qualities to the honey of the country, and is supposed to have been partly the cause of the fatal sickness which befell the army of the Ten Thousand in the celebrated retreat under Xenophon. *Dais laurifolia* (3) is more known on the Continent than in this country; *D. cotinifolia* of the Cape of Good Hope is the species generally seen in shrubberies. *Dirca palustris* (4) is a native of bogs and watery places in various parts of North America, in shady wet woods from New York to Virginia. The branches are excessively tough; the bark is made into ropes, baskets, and other useful articles; the young plants are liable to be devoured by snails; it is therefore seldom planted here. The fruit has narcotic properties. *Pimelea* is a genus belonging to the Southern Hemisphere, and abounding in New Holland. Some are evergreen shrubs; all are hardy in our climate, and very ornamental plants; *P. spectabilis* (5) is the most beautiful species. *Passerina tinctoria* is one of those plants which yield a yellow dye for wool. The seeds of *Inocarpus edulis* are eatable when roasted, and have a pleasant flavour. The bark of *Gnidia daphnoides* affords strong material for ropes to the natives of Madagascar.

This Tribe is abundant at the Cape of Good Hope, common in the cold regions of India and South America. *Lagetta* belongs exclusively to the Tropics. Very few species are natives of Europe. *Drapetes* grows in the Antarctic Islands.

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Santalaceae
The Redwood Tribe

Day & Son Limited

SANTALACEÆ.

THE SANDAL-WOOD TRIBE.

TREES, shrubs, and herbaceous plants; the leaves are alternate or opposite, undivided, sometimes minute and resembling stipules. The flowers are in spikes, seldom in umbels, solitary, small. The calyx is above the ovary, four or five cleft, half-coloured. The stamens are four or five, opposite the segments of the calyx, and inserted into their bases; a kind of plume is attached to the filament. The ovary is one-celled, with from one to four ovules fixed to a central plate, usually near the top; the style is single, the stigma often lobed. The fruit is one-seeded, hard and dry, or drupaceous; the seed contains fleshy albumen.

This Tribe has some affinity with Thymelacææ and Elæagnacææ, but is distinguished by the inferior ovary and the copious albumen of the seed.

Acid and astringent properties prevail in some of these plants.

Santalum, which gives its name to this small Tribe, is derived from the Persian. *S. album* (1) is the famous sandal-wood of Malabar; it is an evergreen shrub, seldom more than ten feet in height, but the wood is extremely fragrant, and is much esteemed in India, where it is said to be impervious to insects. The small musical instruments, boxes, and other articles made of sandal-wood, are now generally known in this country, being favourite examples of the ingenuity of the native workmen of India. The Brahmins consider it one of their sacred trees, and employ the dust of the wood in compounding the pigment with which they paint the mysterious mark on the forehead of their god Vishnoo. The oil used in religious ceremonies and at funerals is extracted from the wood or its shavings. When the trees become old, the central part of the wood acquires a yellowish tinge, and then also it attains the highest degree of fragrance. Not only in Malabar, but in all the islands of the Indian Ocean, the sandal-wood is frequent, and it is exported from the coast to Bengal and China, though seldom brought to Europe. The native doctors value its soothing, cooling qualities. *S. myrtifolium*, a less useful species, grows chiefly on the Circar mountains. The species most common in the Sandwich Islands are *S. Freycinetianum* and *S. paniculatum*. Thesium is

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| 1. <i>Santalum album</i> , <i>Sandal-wood</i> . Malabar.
1A <i>Flower</i> . 1B <i>Opened</i> .
1C <i>Stamen Scale and Plume</i> .
1D <i>Stamen and Plume</i> .
1E <i>Ovary and Pistil</i> . 1F <i>Fruit</i> . | 2A <i>Bud</i> .
2B <i>Flower</i> .
2C <i>Flower opened</i> .
2D <i>Section of Ovary</i> .
2E <i>Section of Fruit</i> . | |
| 2. <i>Thesium linophyllum</i> , <i>Flax-leaved Thesium</i> .
Chalk soil, England. | 3. <i>Leptomeria Billardieri</i> . Tasmania.
4A. <i>Fruit of Leptomeria acida</i> . | |

SANTALACEÆ.

a genus of no beauty of colour or development, yet it is remarkably neat in form and structure of flower; all the species are astringent in the juice. The calyx of *T. linophyllum* (2) is white within, and spreading until the seed ripens, when it closes over it. At the base of the stamens is a small tuft of hairs, not so large and perfect as is the plume of *Santalum*, but one of the characteristics of this Order. It grows chiefly on open chalky places, on the hills on the borders of Cambridgeshire and Hertfordshire, also in Dorsetshire. *T. alpinum* and *T. ebracteatum* are natives of Germany; *T. umbellatum* belongs to North America; and *T. amplexicaule*, to the Cape of Good Hope. *T. Himalense*, nearly resembling our British species, was discovered by Dr. Royle on the arid rocky soil near Choupal, to the north of Choor. *Leptomeria Billardieri* (3) is very common in Tasmania, and has a singular aspect from its almost leafless branches, the minute scale-leaves being so pressed to the branches as to be scarcely discernible. The fruit is acid and astringent, and although very small, frequently serves to allay the thirst of travellers in the wilds of Australia, where water is scarce. The Quandang nut, *Fusanus acuminatus*, of New Holland, has a pleasant flavour and is much eaten by natives and colonists. *Myoschylus oblongus* yields medicine in Chile. An infusion of the leaves of *Osyris nepalensis* is used by the natives of the hills in India as a sort of tea. *O. alba* is frequent in the south of Europe, and the slender flexible branches are very serviceable as packing materials. *Pyrularia pubera* of Carolina contains oil in the kernels of the fruit.

This tribe exists, in Europe and North America, as small herbs; in the East Indies, Australia, and the South Sea Islands, as shrubs and small trees.



Arctostaphylos

Uva-ursi

ELÆAGNACEÆ.

THE OLEASTER TRIBE.

SMALL trees and shrubs, usually covered with resinous glands or dots and minute scales. The leaves are alternate or opposite, simple, and sometimes notched at the edges, with or without stipules. The flowers grow from the base of the leaf-stalks, or in catkins or panicles. The stamens and pistils are often in separate flowers, united in *Elæagnus*. The stamen flowers of the catkins are placed each within a scale; the stamens are from two to eight; the anthers two to four-celled, opening lengthwise. The calyx of the pistil flowers and the perfect flowers is free, tubular, with a fleshy disk which often closes it; persistent; the upper part two to five-toothed. The ovary is free, simple, one-celled, sometimes surrounded by scales, surmounted by one or two stigmas, simple oval-shaped, or dilated, glandular. The fruit is a drupe, covered with waxy secretions, or crustaceous, and enclosed within the succulent calyx or scales. The seed is solitary, and contains very little albumen.

This Tribe has affinity with the Nettle Tribe. *Myrica* forms a link with *Amentaceæ*.

Aromatic, tonic, and astringent properties prevail in these shrubs.

Elæagnus is a genus with slender pale brown branches and silvery leaves. Although selected as the type of the Order, it has not the character of separate stamens and pistil, the flowers being complete in that respect, but without a regular corolla of petals; the single calyx forms the flower, and is more brightly coloured within; four stamens are fixed on it. The whole of the tree, except the older branches, is covered with scales and glands of a silvery hue; the minute scales, when viewed under the microscope, display a beautiful star-like form, reminding of another branch of creation—the scales of fishes. As the leaves become older they acquire a duller browner hue. *E. angustifolia* (1) is the European species, and

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| 1. <i>Elæagnus angustifolia</i> , <i>Narrow-leaved Oleaster</i> .
1A <i>Scale, magnified</i> .
South Europe. | 3A <i>Stamen Flower</i> . 3B <i>Pistil and Ovary</i> .
3C <i>Section of Fruit</i> . |
| 2. <i>Elæagnus argentea</i> , <i>Silvery Oleaster</i> .
North America. | 4. <i>Myrica gale</i> , <i>Sweet Gale</i> .
4A <i>Pistil Flower</i> . 4B <i>Section</i> .
4C <i>Seed-vessel</i> .
Britain. |
| 2A <i>Flower, open</i> . 2B <i>Pistil</i> .
2C <i>Anther</i> . 2D <i>Fruit</i> . 2E <i>Seed</i> . | 5. <i>Myrica javanica</i> .
Java. |
| 3. <i>Hippophaes rhamnoides</i> , <i>Sea Buck-thorn</i> .
Cliffs, Britain. | 6A. <i>Pistil Flower and Scale of M. cerifera</i> .
6B <i>Flower without Scale</i> .
7A. <i>Catkin of Comptonia</i> . |

ELÆAGNACEÆ.

has been for more than two centuries admitted into shrubberies, where the delicate foliage contrasts well with the glossy leaves of evergreen shrubs. The flowers, as well as those of other species, are agreeably fragrant, and contain a honey considered good in fever. It was known to Pliny, who called it the *Wild Olive*. In the low, humid soil about Constantinople the trees grow abundantly; the fruit is sold in the markets, a large supply being brought from Scutari and other places on the Asiatic shore; it is of a dry, mealy, saccharine substance, sweet, and pleasant to the taste. *E. argentea* (2) was introduced from North America; the solitary nodding flowers come forth late in the summer; in its native woods the contrast of its silvery leaves with the rich and brilliant hues of autumn foliage in that country is still more striking than in our plantations. The fruit of *E. orientalis* is eaten in Persia, that of *E. arborea* in Nepal. *Hippophaes* (3) grows on sandy cliffs on the east coast of England, above the sea; the upper surface of the leaves is covered with minute dots, without scales; the lower is clothed with silvery scales. In Sweden the berries are eaten by the peasants, as also in the south of France, where the trees grow plentifully; they are, however, extremely acid, and must be prepared with sugar to render them palatable. It is said to be a good sauce for fish, and the fishermen on the Gulf of Bothnia collect and preserve large quantities of the fruit. The whole plant yields a yellow dye. *Myrica* is a genus preferring moist situations; *M. gale* (4) is a native of swampy bogs and marshes in Wales and other mountainous parts of Britain. An essential oil exists in small pores of resinous substance, which gives a pleasing fragrance to the leaves and berries. A bitter principle is also contained in the leaves, used by some of the poor in northern countries as a substitute for hops. The catkins, when boiled, yield a waxy substance, from which candles might be made; it is also serviceable in tanning skins; both in Sweden and in Wales it is employed to dye wool yellow. In the Hebrides and other Scotch isles medicinal use is made of the leaves; and in the marshes of Cambridgeshire the branches are made into brooms. The flowering branches grow from terminal buds of the former year, which wither at the end when the fruit is completed; new branches come from the side buds—thus a thick, short bush is formed, seldom more than four feet high. *M. cerifera* supplies wax in North America, and is called candle-berry bush. *M. javanica* (6) is a representative of the genus in hot regions. *Comptonia asplenifolia* (7) is tonic and astringent, used as a medicine in the United States.

This Tribe is dispersed throughout all the northern hemisphere, the tropics of South America, India, and the Cape of Good Hope. It is less frequent south of the equator, and very few species are natives of Europe.

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Mimulus





ARISTOLOCHIACEÆ.

THE ARISTOLOCHIA TRIBE.

HERBACEOUS plants and shrubs, some of which are climbing. The wood is without concentric zones and inseparable wedges. The leaves are alternate, simple, stalked, often having a scaly or leafy stipule. The flowers are solitary from the base of the leaf-stalk, usually brown or some dull colour. The calyx is adherent, tubular, regular, or unequal. The stamens are six to twelve, placed upon the calyx, distinct, or adhering to the style and stigmas. The ovary is inferior, six-celled, rarely three or four-celled, the style is single, the stigmas radiating, as numerous as the cells of the ovary. The fruit is dry or succulent, three, four, or six-celled, many-seeded. The seeds are thin, angular, or round, containing fleshy albumen.

This Tribe has very slight affinity with any other.

Tonic stimulating properties exist in the roots and leaves of these plants.

Aristolochia and its allies may be said to form a kind of link between the two great classes of the vegetable world, the dicotyledonous and the monocotyledonous plants, having the chief points of structure of the former, and agreeing with the latter in the ternary arrangement of the parts of the flower and the incomplete formation of the wood. The flowers of this genus exhibit a remarkable diversity of shape and colour, and strange deviations from the regular typical form of a simple corolla; the contrast between the little yellow English species and the large and extraordinary developments of hotter regions, is amongst the most curious to be found in the whole range of the floral world. *A. Clematidis* (1) is so rarely discovered in a wild state in England that it can scarcely be reckoned an original native, but rather a naturalized foreigner, become indigenous only in a few localities where it was formerly cultivated. The site of the garden of the old nunnery of Godstow, near Oxford, is one of the few situations where it is to be seen. The

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| 1. <i>Aristolochia Clematidis</i> , Common Birthwort.
England. | 4. <i>Asarum europæum</i> , Common Asarabacca.
England. |
| 1A Section of Flower. | 4A Stamens and Pistil. |
| 1B Ovary and Stamens. | |
| 1C Stamens and Pistil. | 5A. Capsule of <i>Aristolochia</i> . |
| 1D Anther. 1E Section of Ovary. | 5B Section of Seed-vessel. |
| 2. <i>Aristolochia Sipho</i> , Broad-leaved <i>Aristolochia</i> .
Philadelphia. | 5C Section of Seed. |
| 3. <i>Aristolochia gigas</i> , Gigantic <i>Aristolochia</i> .
South America. | 6A. Wood of <i>Bragantia</i> . |
| | 6B Flower. 6C Seed. |

roots are considered to have powerful medicinal properties, like those of the exotic species. *A. Sipho* (2) is one of the tallest species, and well adapted for covering arbours, making a pleasant shade with its large and numerous leaves. The flower shows a regular ternary division, and is among the simple forms. *A. gigas* (3) affords a striking object to an European traveller in the forests of Guiana, climbing over shrubs, with its fine leaves and remarkable flowers; the latter may be frequently seen on the heads of little native children, worn as a cap in sport. Some of the Brazilian species rank amongst the most powerful in the properties of the roots, which have generally a strong disagreeable scent, and a bitter aromatic flavour. *A. ringens*, *A. galeata*, and others, are of much value in the medicines they yield. *A. fragrantissima*, the Star-reed of Peru, is one of the medicinal plants of that country. *A. trilobata* and *A. odoratissima* afford medicine to the natives of Jamaica. The dried fibrous root of *A. serpentaria* is used in North America to cure the bite of snakes, and is imported into Europe, where it still retains a place as an available medicine. *A. anguicida* is supposed to be the celebrated *Guaco* mentioned by Humboldt. Several kinds grow in Egypt, and are there employed by the famous jugglers to stupefy snakes. India has also a portion of these singular plants, and Hindoo doctors prepare infusions of the leaves and various remedies from the roots. *A. saccata*, on the mountains of Silhet, grows to the height of twenty feet, and has leaves more than a foot in length, and four inches wide; the numerous flowers are suspended in a vertical position on a kind of panicle. *A. cymbifera* and *A. labiosa* have both curiously expanded lips to their flowers. *A. ciliata*, of Patagonia, has the small flower fringed with long glandular hairs: but to enumerate the countless variety of form assumed by this eccentric genus would be impossible. *Asarum europæum* (4) is only occasionally found in hilly woods in the northern counties; near Kirkby Lonsdale it is most plentiful, and is of peculiar appearance with its two leaves and solitary flower. The creeping roots have medical properties. Although India possesses so many powerful medical plants, yet this little European species is sold in the bazaars under the name of *asaroon*. *Bragantia* (6) shows the peculiar formation of the wood of this tribe. *B. tomentosa* is an extremely bitter plant of Java: some species are natives of India and the Malay Isles.

This Tribe is very abundant in the Tropics of South America, frequent in the north of Africa, rare in North America, Europe, and Siberia, existing only in a few species in India. *Asarum* belongs equally to North America, Japan, and Europe.

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Rhus glabra

EUPHORBIAEÆ.

THE SPURGE TRIBE.



TREES, shrubs, and herbaceous plants, with round or irregularly angled stems, often abounding in an acrid milky juice. The leaves are alternate, rarely opposite, simple, seldom compound, sometimes having stipules, often wanting in the succulent species. The flowers grow on terminal stalks or from the base of the leaf-stalks, variously arranged, sometimes surrounded by an involucre resembling a calyx. The calyx is below the ovary and has various scales and glands, the petals when developed alternate with its lobes. The stamens and pistil are in separate flowers, the filaments free or united, the anthers two-celled gaping longitudinally. The ovary is formed of three carpels connected by a central axis, either stalked or not. The styles are equal in number to the carpels; the stigmas are single and distinct, or lobed; the fruit consists of three dry capsules, splitting and separating from the axis with elasticity. The cells are one or two-seeded: the seeds contain fleshy oily albumen.

The separation of stamens and pistil, and want of petals, connect this Tribe with Artocarpacæ and Urticacæ. Those which have petals and united stamens and carpels form a link with the Mallow Tribe.

A poisonous milky secretion, and stinging hairs, belong generally to these plants.

Euphorbia records the name of a renowned physician of King Juba in Barbary, supposed to have been the first to discover the medicinal properties of the genus. It displays a marvellous variety of form in its species. Some are small herbs, as *E. Peplus* (1), one of the commonest weeds in cultivated ground, of no value except that the acrid milk cures warts. Others are shrubs, *E. canariensis*, twenty feet in height. Some are of a succulent nature, and when leafless and spiny assume the aspect of Cactus. *E. meloformis* has a melon-shaped stem, from which the flowers

1. <i>Euphorbia Peplus</i> , Common Spurge.	4. <i>Poinsettia pulcherrima</i> .	Mexico.
1A Capsule. 1B Seed.	4A Flower. 4B Flower. 4C Stamen.	
England.	5A. <i>E. pentagona</i> .	East Indies.
2. <i>Euphorbia splendens</i> , Brilliant Euphorbia.	6A. Flower of Euphorbia.	
Isle of France.	6B Stamens. 6C Flowers.	
	6D Section of Ovary.	
3. <i>Jatropha integerrima</i> .	7A. Seed of <i>E. Lathyris</i> , Caper Spurge.	
3A Stamens. 3B Pistil.	8A. <i>Hura crepitans</i> . Seed-vessel.	
Cuba.		

proceed on the top, after the manner of Cactus; and the great Medusa-head Euphorbia of Africa has a strong resemblance to that Tribe also. But an obvious distinction exists in the spines, which in these plants are either single or in pairs, never clustered as in Cactus. *E. splendens* (2) is an example of a coloured involucre having the appearance of petals, and is one of the most brilliant of the genus. Some of the East Indian species have bright yellow involucres. Although a virulent poison pervades the tribe, yet a considerable quantity of wholesome food is obtained from it by skilful preparation with heat. The principal plant yielding the supply is *Manihot utilissima*, from the long roots of which, weighing thirty pounds, the natives of S. America make Cassava for their own use, and Tapioca for exportation. Cassava-bread is the chief nourishment of the Indians of Brazil and Guiana, but is not thought wholesome by the Europeans. *Euphorbia balsamifera* is boiled into a jelly by the inhabitants of the Canaries, who consider it a delicacy. The oil of the seeds is the most important medicinal product, and is of a very powerful nature: that of *Croton Tiglium*, an East Indian tree, and of *Ricinus communis*, the Castor-oil plant of Africa, are of extensive value. The latter is known here only as herbaceous, in its native country it is arborescent; the spiny capsules full of oily seeds are a very ancient medicine. *Euphorbia officinarum*, and others, afford the medicinal gum resin Euphorbium. The juice of *E. linearis* is a remedy for weak eyes in Brazil. Fifteen species of Spurge are natives of Britain, thirty-three grow on the Continent. It appears to be one of those plants which, if found at all, is abundant. The steep hills in the interior of South Africa are thickly clothed with low bushes, over which countless tall Euphorbias rise. Several are seen in the sandy lands of Nubia. The juice of *E. phosphorica* sheds a light during hot nights. *Jatropha* (3) is a genus of some beauty in the West Indies and South America. *Poinsettia* (4) in its native country bears a cluster of red bracts twenty inches across, clearly showing a transition state between leaves and petals; these constitute the ornament of the plant, for the flowers are small, and, though curious in structure, not beautiful. The Sand-box tree of the West Indies, *Hura crepitans* (5), is chiefly known here in its curious seed-vessel, which bursts with a loud noise when ripe. The fruits of *Anda*, *Emblica*, and a few more, are eatable in their respective countries. The juice of *Crozophora*, *Ditassa*, and others, yields useful dyes in Brazil. *Siphonia elastica* affords, from its milky juice, the bottle India-rubber, retaining the pale colour within, but blackened by smoke without. *Hippomane Mancinella* contains in its pure white liquid one of the most fatal of poisons. The Tallow-tree of China, *Stillingia sebifera*, yields an oily substance around the seeds which serves for candles. *Elæococca* oil is used for lamps and for painting. *Cascarilla* bark is obtained chiefly from *Eleuthera* in the Bahamas. Among the useful plants of this tribe is *Buxus sempervirens*, the Box-tree, the wood of which is excellent for engraving; it grows remarkably well on Box Hill, in Surrey, and when the trees were cut in 1815, the value was 10,000*l*. On the Pyrenees considerable tracts are covered with this beautiful evergreen shrub. The bitter leaves are unwholesome to camels if eaten by them in Persia, where the trees abound.

This extensive tribe, containing as many as 2500 species, exists most abundantly in the Tropics of America, diminishing from the Equator: very few are known in N. America, as far as Canada. In North and South Africa are many succulent species.



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ARTOCARPACEÆ.

THE BREAD-FRUIT TRIBE.

TREES and shrubs with a milky juice, sometimes of a climbing nature. The leaves are alternate, simple or lobed, of various texture, with large stipules rolled up and enclosing the young leaves, leaving a scar when they fall off. The flowers are inconspicuous; the stamens and pistils are in separate flowers. The stamen flowers have sometimes a very small calyx of two to four scales, or it is tubular; the stamens are inserted into the base of the calyx opposite its lobes, and of the same number: the anthers are two-celled, and open lengthwise or into two plates. The fertile flowers are variously arranged, over a fleshy receptacle, concave, globose, or spiked; the calyx is tubular, or in two rows of sepals. The fruit is surrounded by a fleshy involucre, or composed of thick fleshy calyxes, enclosing numerous nuts, or collected into a fleshy mass by the consolidated succulent calyx; the seed is solitary, and contains fleshy albumen.

This Tribe has affinity with Urticaceæ and Euphorbiaceæ.

Wholesome fruit, and a milky juice containing caoutchouc, are characters of these trees.

Artocarpus incisa (1) is one of the most valuable trees of the South Sea Isles, whence it was introduced to the West Indies and to South America. The wood serves to build houses and boats; the leaves, often as much as two feet in length, are used for various purposes; the juice yields a glutinous cement for covering water-vessels; and the fruit, containing a large proportion of starch, affords an abundant supply of nourishment to the natives. It is not eaten in a raw state, but is usually cooked in Palm-oil, or roasted; the taste is insipid, but is thought to resemble that of wheat bread. *A. integrifolia*, the Jaca, is of inferior value as food, but the fruit often weighs twenty pounds. *Ficus* is a genus of very ancient fame, and of peculiar interest, having been chosen as an object to teach divine wisdom to the Jews. The milky juice of the stem and branches is in some species extremely acrid; that of *F. toxicaria* is a strong poison. In others it is harmless, and in the cow-trees affords a pleasant beverage. The milk of plants generally

1. *Artocarpus incisa*, Bread-fruit Tree.

South Sea Isles.

1A Stamen Flower.

1B Pistil and Ovary.

1C Section of Seed.

2. *Ficus carica*, Common Fig. South Europe.

2A Section of Fruit.

2B Flower. 2C Seed.

3. *Morus nigra*, Mulberry.

Italy.

3A Stamen Flower.

3B Pistil Flower.

3C Section of Fruit.

3D Seed. 3E Ovary.

4. *Dorstenia hispida*, Hairy Dorstenia.

Brazil.

contains caoutchouc,—that of *F. elastica* furnishes Indian rubber to the whole peninsula of India. Other species supply the Isles of the Indian Ocean. In S. America, *F. radula*, *F. elliptica*, and a few more, yield it. It is one of the wonderful chemical properties of fruit to be able to convert injurious acrid juices into delicious saccharine substance; in the Fig (2) this power is displayed in a striking degree. The juice of the branches is highly pungent, but when the process of ripening is complete in the fruit, an extraordinary quantity of sugar is secreted, exuding in a clear candid drop at the top, commonly called the tear of the fig. The arrangement of the countless minute flowers within the fleshy receptacle is a singular exception to the normal type of flower and fruit. *F. indica* is the celebrated Banyan tree of India, possessing an extreme capacity of growth; for though it is usually found in a barren sandy soil, yet, in the course of a few years, one stem will constitute a grove from its numerous rooting branches, affording a sacred shade to the religious natives of India, and a habitation for countless parasitical plants. *F. microcarpa*, of Java, is of very rapid growth, and forms a dense and grateful shelter. The leaves of *F. religiosa*, the Peepul of India, terminate in a long slender point, and being of a tough substance, are used by the Chinese to paint upon. *Morus* (3) is more valuable for its leaves than for its fruit, although the latter is pleasant and wholesome. The leaves are the chief food of silk-worms, for which the trees are cultivated abundantly in Italy; those which still exist in gardens near London were planted in the time of James I., who wished to establish the silk manufacture in this country. *M. alba*, a nearly similar species, is the most common in Spain. *Dorstenia* (4) is a singular genus, bearing numerous small flowers on a concave receptacle, not closed, like that of the Fig. The pungent roots of *D. contrajerva* are imported from South America, and used as medicine and for dyeing. The famous Cow-tree of South America, yielding a copious milky juice, is a species of *Brosimum*: travellers relate that the negroes may be seen going forth early in the morning to obtain a supply of the milk. The nuts of *B. alicastrum*, like all the seeds of this Tribe, are wholesome, and are of good flavour when roasted. *Broussonetia papyrifera* has a succulent hispid fruit; a kind of paper is made of the bark. The celebrated Upas, whose poisonous exhalations have been much exaggerated, is *Antiaria toxicaria*. *Cecropia peltata* is remarkable for the stem being hollow between the joints. The fruit of *Maclura* is known as the Osage Orange; it yields a yellow juice, with which American Indians stain their faces before going to war. *Phytocrene*, the Water-vine of Martaban, has a soft porous wood, and exudes a pure tasteless fluid, drunk by the natives. In the west of India grows *Lepuranda saccidora*, of whose branches sacks are curiously formed; a suitable portion is cut off and soaked till the fibrous bark can be pulled down off it, when the wood is sawn away, leaving only a piece to close the end of the sack.

This extensive Tribe exists chiefly in the Tropics. A few species only advance into Temperate regions: none are natives of Europe.



Humulus lupulus
 h. lupulus

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U R T I C A C E Æ.

THE NETTLE TRIBE.

TREES, shrubs, and herbaceous plants, some of which have rough stems. They contain no milky juice. The leaves are alternate, simple, or lobed, usually covered with asperities, or stinging hairs; stipules usually membranous and deciduous. The flowers are herbaceous, inconspicuous, the stamens and pistil are usually in separate flowers, which are in catkins, or close heads, or scattered. The calyx is membranous, lobed, or in single scales, persistent. The stamens are of definite number, distinct, inserted into the base of the calyx and opposite its lobes; the anthers, often curved inwards in the bud, turning backwards with elasticity when the flower expands. The ovary is above the calyx, the stigma single and fringed. The fruit is a simple closed nut, surrounded by the membranous or fleshy calyx, containing one seed, which has either fleshy albumen or none.

This Tribe has close affinity with Artocarpaceæ, but is distinguished by having no milky juice.

An excessively caustic alkaline juice, and narcotic properties, exist in many of these plants.

Urtica, the type of this Order, is a genus remarkable for its stinging properties; and several species are covered with small projecting vesicles full of a strong alkaline juice, surmounted by a tubular prickle, spiral on its surface, with a sharp point, by which it is enabled readily to penetrate the skin and infuse the irritating juice. *Urtica pilulifera* (1) is not very frequent in England, but is occasionally found on heaps of rubbish. *U. dioica* is the common Nettle on all neglected ground. *U. urens* is most frequent as a garden weed: all these species, and several others, have strong stings. But the most powerful in its causticity is perhaps the *U. baccifera*, of the Antilles; the entire plant is clothed with large stinging hairs of considerable force. *U. caracasava* is a native of Caracas, where it grows to the height of eight feet, the shrubby stem marked with the great scars of fallen leaf-stalks. The leaves are heart-shaped, twenty-two inches long, and only slightly stinging. This genus is found on the Sikkim Himalaya, up to nearly ten thousand feet, mingled with

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| 1. <i>Urtica pilulifera</i> , <i>Roman Nettle</i> . England. | 3. <i>Humulus lupulus</i> , <i>Common Hop</i> . England. |
| 1A <i>Stamen Flower</i> . 1B <i>Stamens</i> . | 3A <i>Stamen flower</i> . |
| 1C <i>Seed-vessel</i> . 1D <i>Carpel</i> . | 3B <i>Pistil flower</i> . 3C <i>Bract</i> . |
| 1E <i>Hair, magnified</i> . | 3D <i>Grain of Lupuline, magnified</i> . |
| 2. <i>Cannabis sativa</i> , <i>Hemp</i> . India. | 4A. <i>Urtica dioica</i> . <i>Section of Seed-vessel</i> . |
| 2A <i>Stamen flower</i> . 2B <i>Flower, opened</i> . | 4B <i>Hair, magnified</i> . |
| 2C <i>Sepal</i> . 2D <i>Stamen</i> . | |

URTICACEÆ.

Picus: *U. heterophylla* is of gigantic size, on borders of maize-fields. *Urtica* abounds also in the Lucon Isles. *U. urentissima* is said to cause bad effects, which endure for a year, to the inhabitants of Timor; the leaves of the *U. crenulata* and other Indian species are scarcely less poisonous. Some, however, possess useful properties; the tubers of *U. tuberosa* are eaten by natives in India, and the tough fibrous stalks of *U. tenacissima* and of *U. cannabina* are made into strong cordage in Sumatra. *U. dioica* is wholesome when young, and the stalks may be made into cloth or paper; this is one of the most widely dispersed species, growing all over Europe, in Siberia, Japan, Barbary, and elsewhere. *Cannabis sativa* (2) was known to the Arabians in the most remote period, and the manufacture of Hemp is as ancient as that of Flax. It requires a rich soil and warm climate, in some parts of Italy attaining the height of eighteen feet: in this country it is seldom above six feet. Throughout Germany and all Continental countries it is cultivated to a great extent, and affords a valuable crop. The plants are pulled up when fully ripe, and left to wither and bleach on the ground; after which the stalks are beaten to separate the fibres. From these every variety of cordage and rope, and strong cloth, are made. An useful oil is extracted from the seeds, employed in painting here, and in cookery in Russia. In hot countries a peculiar and fragrant resin is developed on the Hemp plants, which has powerful narcotic properties, and, being collected in small masses, is used as a stimulant by Indians, Hottentots, Egyptians, Arabians, and Brazilians. *Humulus lupulus*, Hop (3), was first brought to England from Flanders as a cultivated plant, in the time of Henry VIII., though it is occasionally found wild in Great Britain. In the third year of growth the plants bear fruit, being trained to poles about sixteen feet high; in Bavaria they attain a greater height, and produce abundant crops with more constancy than here. The fertile capsules are the valuable portion, each scale having one seed at its base; they are covered with minute resinous drops, bitter and narcotic, peculiarly adapted for making good beer. The scent of the dried clusters of flowers is highly soporific, which renders them available to procure sleep in sickness, when narcotic medicine is unsuitable. The fibres of the stalks are woven into cloth in Sweden, and the leaves are used to dye yellow. *Parietaria*, the pellitory of old walls and ruins, belongs to this Tribe, and is the only British example, besides *Urtica* and *Humulus*. *Parietaria* clings to forsaken ancient buildings; *Urtica* hovers about the present dwellings of man, ever to be seen in cultivated ground, and by the wayside rough places.

The plants of this Tribe are widely dispersed over all parts of the world: in the hottest regions of the Tropics, in the coldest northern countries, on dry walls, and in the damp primæval forests. *Cannabis* inhabits the cooler parts of Asia.



100

101

102

PIPERACEÆ.

THE PEPPER TRIBE.

SHRUBS and herbaceous plants, with jointed stems, sometimes of a climbing habit. The leaves are opposite, or in whorls, or alternate from one of the pair remaining undeveloped; sometimes having one or two stipules at their base. The flowers are usually without stalks, in spikes at the ends of the branches, or from the base of the leaf-stalk, or opposite to it, usually without sepals or corolla, having a bract only. The stamens are two, or more, placed on one side, or around the ovary. The anthers are one or two-celled, the connecting portion being often fleshy. The ovary is free, simple, one-celled, containing one ovule. The stigma is short, simple, rather oblique. The fruit is fleshy, one-celled, one-seeded, remaining closed. The embryo lies at the top of the seed, outside the albumen.

This Tribe has affinity with Urticaceæ, and some parts of the structure connect it with Araceæ amongst Monocotyledonous plants.

Pungent aromatic properties exist in the resin and ethereal oil of these plants.

Piper is apparently derived from *Pipul*, the name of long pepper in Bengal. *P. nigrum* (1) is the species most known and used in this country, and is imported largely from the East, where it is cultivated extensively. The fruit is the valuable part, with the outer skin left, being called black Pepper: when rubbed off it becomes white Pepper. Its pungent quality does not exist in the essential oil, as is usual in other spices, neither does it rise by boiling in water. The plants generally contain a white crystallizable substance, piperine, which, as well as the oil and the resin, are extremely beneficial in intermittent fever, said to equal Quinine. Both as a medicine and a condiment Pepper is of much value. In the East Indies and in Cochin-China it grows wild, but it is planted in fields in Java and Sumatra, poles being fixed for the young trees to climb over. After the ripe berries are gathered in September, the plants are cut down; in about three years they again bear a crop of fruit. *P. Betle* (2) is an important species in Southern Asia, its

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| 1. <i>Piper nigrum</i> , Common Pepper. | | 4A <i>Spike, magnified.</i> | |
| 1A <i>Flowers.</i> 1B <i>Fruit.</i> | East Indies. | 4B <i>Flower, magnified.</i> | |
| 1C <i>Section of Fruit.</i> | | 4C <i>Section of Ovary.</i> | |
| | | 4D <i>Section of Fruit.</i> | |
| 2. <i>Piper Betle</i> , Betel. | East Indies. | 5. <i>Artanthe elongata</i> , Matico. | Peru. |
| 3. <i>Piper ribesioides</i> . | South America. | 6A. <i>Chavica Roxburghii</i> , Long Pepper. | |
| 4. <i>Peperomia aricarinata</i> . | South America. | <i>Flower spike.</i> | |

PIPERACEÆ.

leaves serving to wrap round slices of the Areca-palm nut, which forms the constant stimulant of the languid natives of hot regions in Asia, and is still more indispensable throughout the East, than even Tobacco in the western countries of the world. *P. trivium* is an extremely pungent species: several others are known in conservatories, but are not cultivated for use. Long pepper is the spike of pistil flowers of *Chavica Roxburghii*, in an unripe state, dried; the root and stem are sliced and prepared for medicinal uses. *C. majuscula* of Java has an useful bark. *Peperomia* is a genus lately separated from the true Pepper, but without any material distinction. *P. pellucida* is eaten as a salad when in a young state, in the West Indies. *P. aricarinata* (4) is usually to be seen in collections of these plants in the conservatories of our botanic gardens. *Artanthe elongata* (5) is of high repute in Peru, known as *Matico*, and possessing powerful astringent properties. *A. crocata* yields a yellow dye in Java. Among the narcotic plants of this Tribe *Macropiper methysticum* is much celebrated in Ava, the valuable qualities existing in the large rugged root. The fruit of *Cubeba officinalis* and other species is known as Cubebs in the bazaars of India. *Acrocarpidium hispidulum* is a bitter medicinal plant of the West Indies. *Coccobryon capense* belongs to South Africa, and is of considerable use. Various other species are employed in their respective countries for various purposes, but none are to be compared with Pepper for extensive dispersion and value.

This Tribe is limited to the hottest regions of the world; it abounds in tropical America and the islands of the Indian Archipelago, in low damp valleys, and on the shores of rivers. It is rare in equinoctial Africa, but more frequent at the Cape of Good Hope.

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A M E N T A C E Æ.

THE OAK TRIBE.

TREES and shrubs, the leaves are alternate, simple or lobed, the veins sometimes proceed straight from the midrib to the margin, the notched edges sometimes have glands; the stipules are either deciduous or persistent. The flowers are in catkins, and have stamens and pistil separate. The stamens vary from five to twenty, and are inserted into the base of the calyx, or scales, generally distinct, sometimes united. The anthers are two-celled. The ovary is sometimes crowned by the rudiments of the calyx, within an involucre. The fruit is a bony or leathery one-celled nut, more or less enclosed in its involucre, as in *Quercus* and *Corylus*, or it is combined with the scales into a kind of cone, as in *Betula*, or it has many silky seeds, as in *Salix*. The seeds have no albumen.

This Tribe is slightly connected with *Coniferaceæ*.

Tonic astringent properties exist in the bark, and a balsamic oil in some species. *Quercus* is an important genus; *Q. pedunculata* (1) was formerly very abundant in England; the acorns served to feed large herds of pigs. The timber is hard and more enduring than stone in some buildings; it is also very well adapted for ships. The bark contains tannin, which renders it valuable in the preparation of leather; the galls formed on the leaves by an insect, yield a black juice, used in making ink and in dyeing. *Q. Ilex* is the evergreen oak, frequent in the south of Europe, forming part of the varied and beautiful woods on the Mediterranean coast of Italy. *Q. suber*, the cork-oak, grows luxuriantly in Portugal, affording a good supply of the useful inner bark. The oaks of Java have chiefly smooth-edged leaves. *Q. angustata* is found on the mountains, at 5000 feet elevation, flowering in spring, whilst the fruit of the preceding year ripens. *Quercus* ascends on the south side of the Himalayas, above 11,000 feet, but in the interior of Sikkim neither

1. *Quercus pedunculata*, Common Oak.

Britain.

1A Stamen flower.

1B Stamen and Scale.

1C Pistil flower. 1D Section of Ovary.

2. *Corylus Avellana*, Hazel-nut. Britain.

2A Stamen flower. 2B Pistil flower.

3. *Fagus sylvatica*, Common Beech. Britain.

3A Stamen flower. 3B Section of Ovary.

3C Section of Fruit.

4. *Castanea vesca*, Common Chestnut.

England.

5. *Salix viminalis*, Common Osier. Britain.

5A Stamen flower.

5B Capsule. 5C Seed.

6. *Salix herbacea*, Least Willow. Hebrides.

7. *Betula pendula*, Drooping Birch. Scotland.

7A Calyx scale. 7B Winged Seed.

oak nor chestnut are seen above 9000 feet. The N. American oaks are numerous, and supply excellent timber. *Q. coccineus*, with its richly-tinted foliage, contributes largely to the brilliancy of the autumnal scene. On high land or near the influence of the sea oaks become stunted, and crooked branches grow within a few feet of the ground; in the woods near Cromer they are of this form, and produce no straight trunk for timber. But the most remarkable instance of deformity is in the Wistman's Wood, on Dartmoor, where the oaks are scarcely 12 feet high, the branches twisted and knotted, and covered with moss and lichen. It is said there is a record of this wood in the time of the Norman conquest. *Corylus* (2) received its specific name from Avellino, a valley in the south of Italy, where it grew in such abundance as to furnish a profitable trade in the fruit. It is very common in English copses, and is valuable for the nuts and also for the wood, which is serviceable for hoops, fishing-rods, and countless small articles. *Fagus sylvatica* (3) is of ancient fame, the nuts, called *mast*, being supposed to have formed part of the food of man in the earliest period. It is one of the noblest of British trees, attaining great vigour and beauty of form: the thin and supple bark is used for light boxes and baskets. Beech-woods cease above Calmar, in Sweden, at 57° north latitude; beyond that limit only single trees are seen. A town of Thessaly gave its name to *Castanea* (4); in that country, as well as on the Apennines, chestnuts prepared in different ways afford a welcome and wholesome food to the peasants. The chestnut-trees on Mount Etna are of great antiquity and immense size; when old, the stems acquire vast bulk at the base, and the bark becomes twisted, giving the appearance of carved columns, as may be observed in Greenwich Park. *Castanea* extends northwards to the south of Sweden. *Salix* includes many species, some affording valuable timber, others useful materials for baskets of all kinds. The tough pliant branches of *S. viminalis* (5) are available for a variety of purposes. *S. herbacea* (6), the smallest of shrubs, is one of the rare plants of the Hebrides; by the side of Alpine streams it spreads to a considerable extent, the roots penetrating the fissures of rocks. *S. repens* is of great value in the sands of Holland and Westphalia, binding the loose soil. *S. planifolia* flourishes in the cold climate of Labrador; *S. serrulata* and others in Lapland; *S. lanata* in Norway. A very few belong to hot countries; *S. Humboldtiana* to Peru; *S. tetrasperma* to the East Indies. *S. babylonica* is the celebrated weeping willow. *Betula pendula* (7) is the most graceful of the genus, preferring mountain localities from Lapland to Asia. *B. alba*, the common birch, is the highest of trees on the Himalaya, growing at 14,000 feet on the northern slope. In the north of Europe it is of various use, the young shoots make a kind of tea for the Finlanders; the Laplanders form tents with the supple branches; in Sweden and Norway the bark covers huts, and is ground to mix with oatmeal for cakes. *Populus*, the poplar, is dispersed in Europe and North America; the Abele and Aspen grow in moist places in England, the long leaf-stalks being compressed laterally tremble in the lightest breeze.

This extensive Tribe inhabits forests in all Temperate countries; it is rare in South America and the north of Africa; not known at the Cape. *Fagus* extends to the Antarctic regions; *Betula* appears on the highest mountains of Asia and America.

11-87
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CONIFERACEÆ.

THE FIR TRIBE.

LARGE trees and shrubs, with branching stems, full of resin. The woody tissue is marked with circular scars. The leaves are evergreen, linear, rigid, entire at their margins, veinless, rarely lobed, and with forked veins, usually in bundles wrapped at their base in a membranous sheath. The flowers are without calyx or corolla, but surrounded by bracts: some consist only of a single stamen, or a few united, usually collected on a common stalk into a kind of catkin. The anthers are two, or many-lobed, bursting longitudinally, often surmounted by a crest. The pistil flowers are in cones; the ovary rises from the base of a membranous bract, bearing two or more ovules. The fruit is composed of the enlarged and hardened cone of scale-shaped ovaries and bracts; or it is solitary, as in *Taxus*, and has the seed partly enclosed in a succulent cup. The seed has a hard, crustaceous covering, the embryo is in the midst of fleshy oily albumen, and has two or many cotyledons.

This Tribe has close affinity with *Cycadaceæ*.

Various kinds of resin are secreted by these trees.

Pinus, the chief genus of this cone-bearing Order, is of extensive value; the word is of Celtic origin, and hence have been derived all the European names. *P. sylvestris*, the Scotch Pine, or Fir, as it is generally called, is the only British example; its timber, known as Deal, is the most useful and durable of all the woods of Temperate climates, and it yields pitch and oil of turpentine for important uses. *P. maritima* (1) has its leaves in pairs, and cones solitary. *P. Pinaster* bears cones in clusters. *P. Pinea* is the Stone Pine which adorns the Mediterranean coast of Italy, sometimes growing out of the rocky slopes, and with its crown of dark foliage forming a very picturesque object. The Greeks still use the wood for ships. *P. palustris* of N. American swamps, has leaves a foot long; *P. canariensis* has similar foliage, and mingles strangely with the rest of the vegetation of the Peak of Teneriffe, between 4000 and 6000 feet. *P. apulcensis*, of Mexico, is distinguished by extremely twisted branches. *P. occidentalis* belongs especially to St. Domingo and Cuba. The cones of the different species vary in size, those of *P. excelsa*, of the Himalaya, are fourteen inches long and slender; those of *P. pungens* of N. America have sharp bent prickles on each scale. *Abies*, the true Fir, belongs chiefly to N. America; *A. alba*, the white Spruce, extending to within ten miles of the Arctic Sea. The Larch, of Germany and Switzerland,

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| 1. <i>Pinus maritima</i> , Sea-coast Pine. | 3. <i>Taxus baccata</i> , Yew. | Britain. |
| South coast, Europe. | 3A Stamen flower. | |
| 1A Stamen. 1B Section of Seed. | 3B Pistil flower. 3C Seed. | |
| 1C Many Cotyledons of Seed. | 4. <i>Larix Cedrus</i> , Cedar. | Mount Lebanon. |
| 1D Scale and Seeds. 1E Seed. | 5. <i>Cupressus sempervirens</i> , Cypress. | Levant. |
| 1F Section of Seed. | 6. Cone of Wellingtonia. | 6A Section of Cone. |
| 2. <i>Juniperus communis</i> , Juniper. | 7A. Seed of Araucaria. | 7B Section of Seed. |
| 2A Stamen flowers. | 8A. Cone of <i>Cryptomeria japonica</i> . | China. |
| 2B Scale and Anthers. 2C Pistil flower. | | |

Larix communis, is one of the most frequent and beautiful trees on the lower range of the Alps, reaching to 6000 feet elevation; the leaves are deciduous, the wood valuable for building, becoming a fine red brown exposed, unpainted, to the Alpine climate: the bark contains tannin. The Cedar of Lebanon (4) once existed in extensive forests on the sides of Libanus, the only native locality; but from the time of Solomon, when vast numbers of the trees were hewn down to build the Temple, it has become very scarce there. No other tree of this tribe has a more majestic aspect, especially when countless cones stand erect on the horizontal branches. *Juniperus* (2) is a native of open places and hills in the northern parts of Europe; on the Alps, also, it grows abundantly; the young shoots and the berries are used in the preparation of ardent spirits. *J. Bermudiana*, a tree forty feet high, affords the cedar-wood for buildings in the West Indies, and the cases for our Cumberland lead pencils. *J. Virginiana* is the red Cedar, a highly fragrant and durable wood for cabinet work. *J. recurva*, with long drooping branches, appears occasionally on the Himalaya. *Taxus* (3) is found chiefly in mountainous woods in Europe, N. America, and Japan; in Germany it still abounds, but it is much less frequent in Britain than formerly. Until the time of Henry VIII., the wood was in constant demand for bows. Yew-trees live to a great age, and acquire large trunks; two of the most remarkable are those near the forest of Brotonne, in France, said to be verging towards 1500 years. In Temperate countries they flourish on plains, on the Andes they find a suitable temperature at 8000 feet. *Cupressus* (5), common in the Levant and in South Europe, is frequently planted around palaces, and in cemeteries. It endures to great longevity in a favourable soil and climate; a Cypress at Somma in Lombardy is said to have sprung from the earth before the Christian era, and is still regarded with veneration; when Buonaparte planned the famous Strada Sempione, the ancient Cypress was carefully avoided. The famous gates of Constantine's cathedral, at Constantinople, made of the wood, existed upwards of 1100 years. *Schubertia disticha*, known as the deciduous Cypress, belongs to Mexico, and is there much esteemed; the finest examples in this country are in the gardens of Syon House, Isleworth. *Araucaria imbricata* was introduced by Sir Joseph Banks, a tree of stately, symmetrical growth, the branches clothed with perennial rigid leaves, at first pointing upwards; gradually with age becoming bent downwards. *A. excelsa*, of Norfolk Isle, is lofty and grand. The seeds of *A. Bidwillii* (7), of Australia, being nearly free of turpentine, are eaten by the natives. Amongst the noblest of trees ranks the Dammara Pine of New Zealand, often growing with a straight stem of 100 feet. The graceful Deodara of the Himalaya, is now acclimatized in our gardens, although its native place is from 7000 to 12,000 feet on the mountains of Asia. *Cryptomeria japonica* (8), lately imported from the extensive plain of Shanghae, is of extreme elegance of growth. The last discovered tree of this tribe, now added to English plantations from California, is the surpassing *Wellingtonia gigantea*. About 100 trees exist in a forest on the slopes of the Sacra Nivada, near the head waters of San Antonio, in 38° N. lat., 5000 feet above the sea. The stems rise to 245 feet in height, unbranched, until towards the summit; the branches droop and bear cones (6) at their points; the Indians shake out the seeds, roast, and eat them, whole or bruised. *Pinus* and *Araucaria* appear to have grown abundantly in this island during a former epoch of its existence, fossil remains being found at Whitby and at Lyme Regis.

This Tribe inhabits various countries from the Tropics of Asia to the Arctic regions. The chief portion exists in Temperate climates, in Europe, Siberia, China, N. America. *Pinus* belongs to the Northern Hemisphere, *Araucaria* to the Southern.

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CYCADACEÆ.

THE CYCAS TRIBE.

SMALL trees or shrubs. The stems are either simple, or cylindrial, or round, or dichotomously branched; marked on the surface with the scars of broad leaf-stalks. The interior of the stem consists of a mass of pith traversed by woody fibres usually irregularly disposed, sometimes in numerous concentric circles. The woody tissue contains glands and spiral vessels. The leaves are pinnated, firm, and woody, perennial, generally rolled inwards when young. The flowers have stamens and pistil separate, and are without calyx or corolla. The stamen flowers are on terminal cones, composed of scales covered on their lower sides with one-celled anthers, which split longitudinally. The pistil flowers are simple naked ovules, placed beneath scales on the margin of contracted leaves. The seeds are hard or spongy coated nuts, with one or more embryos suspended by a thread in the cavity of fleshy or mealy albumen.

This Tribe has close affinity with Coniferaceæ, the young leaves rolled inwards connect it with Ferns, and in general aspect it resembles Palms.

The stems and seeds of these plants contain wholesome starchy substance, as well as nauseous mucilaginous juice.

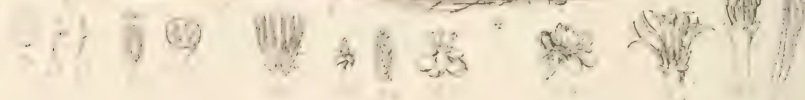
Cycas is the selected type of this remarkable though small tribe; the same name was bestowed by the ancients on a dwarf Palm which grew in Ethiopia. The genus forms an obvious link with Palms and Firs, the columnar stem and single crown of flowers connect it with the former, the cone of fructification with the latter; in the internal structure also a similarity exists, the woody vessels of the stem being marked with circular disks like those of Firs, and rarely found elsewhere. The stem has no true bark, but is invested with a dense covering of the old bases of leaf-stalks. *Cycas revoluta* (1) was first brought to England in 1758; the ship being attacked by an enemy, the head of the plant was shot off; the stem afterwards sent out a fresh shoot, and thus the curious novelty grew and multiplied in its strange country. The stem contains a cellular starchy substance which in Japan is made into a kind of sago, so nourishing that the Japanese soldiers are able to live on a very small portion of it as their daily food. The celebrated traveller, Thunberg, found it to be of excellent quality. *C. circinalis* (2), a native of the Moluccas, has sometimes a stem 30 feet high; the chief distinction of the

1. <i>Cycas revoluta</i> , <i>Narrow-leaved Cycas</i> .		<i>Fertile Frond.</i>	
1A <i>Stamen Scale.</i>	China.	2B <i>Fruit.</i>	2C <i>Section of Ovule.</i>
1B <i>Under surface, with Anthers.</i>		2D <i>Embryo.</i>	
2A. <i>Cycas circinalis.</i>	East Indies.	3A. <i>Leaves of Zamia.</i>	Cape of Good Hope.

CYCADACEÆ.

species is that the leaves are more curled. Sago is prepared from the pith and stem; the fruit is also eaten, and a mealy substance is obtained by grinding the kernels. Blume, who explored Japan and examined its vegetation, describes a clear transparent gum exuding from those plants, resembling Tragacanth, valuable in healing ulcers. *Zamia* (3) is a genus of very similar aspect to *Cycas*, bearing a crown of rigid pinnated leaves, the flowers collected in a cone. It is one of the most prevalent and striking forms of vegetable life in South-Eastern Africa, covering wide tracts on the Caffir frontier. *Z. horrida*, with its stiff grey foliage, beset with prickles at the points of the leaves, is of peculiarly displeasing appearance. *Zamia* belongs also to the West Indies, affording food to the natives; the stem of *Z. pumila* and other species contain a supply of wholesome starchy meal. *Encephelartos* is another genus growing at the Cape of Good Hope, known as Caffir-bread, the interior of the stem being eaten by the Caffirs. In Mexico this tribe is represented by *Dion edule*, the large seeds of which furnish arrowroot to the natives. The cones of flowers are scarcely distinguishable from those of *Araucaria* in the Fir tribe, clearly indicating the affinity of the two Orders. Although none of these plants exist at present amongst the native Flora of this island, yet abundant fossil remains prove that in a former period of the world they formed a considerable portion of the vegetation.

This Tribe inhabits the Tropics, and the Temperate parts of Asia and America. It is found also in Madagascar, and at the Cape of Good Hope, but it does not exist in equinoctial Africa.



HYDROCHARIDACEÆ.

THE FROG-BIT TRIBE.

FLOATING water-plants, the leaves have parallel veins, and are sometimes spiny. The flowers are enclosed in a spathe. The stamens and pistil sometimes in different flowers; the calyx is composed of three sepals; the petals are three, occasionally wanting. The stamens are of definite or indefinite number; in *Hydrocharis* some are beaked. The ovary is adherent, composed of several carpels, one, six, eight, or nine-celled; the stigmas are from three to six. The fruit is dry or succulent, not gaping, with one or more cells. The seeds are numerous, and contain no albumen.

In many points of structure this Tribe has affinity with *Alismaceæ*; the spathe forms a connecting link with *Araceæ*.

Some of these plants are wholesome as food.

Hydrocharis was named from the Greek, on account of its being considered one of the prettiest of European water-plants. It spreads far with long runners, from the points of which proceed roots, penetrating the mud, and young buds, enclosed in two scales, afterwards becoming separate plants. In the watery places of the Isle of Ely, the Frog-bit (1) was formerly very abundant, but is now less frequent. The leaves are mucilaginous, and slightly astringent: they have large stomas or pores on their surface. Some few characters prevail generally in aquatic plants: here a resemblance may be traced in the form of the leaves to those of small water-lilies: in this instance it affords a proof of the countless links which are found amongst plants, even where the principal structure may be different. From similarity of aspect, the Frog-bit was by old writers called *lesser water-lily*; and modern botanists perceive the analogy, although the one plant belongs to the great division of monocotyledons, the water-lilies to the dicotyledons. *Stratiotes* (2) derived its name of *water-soldier*, from its stiff sword-shaped leaves, and upright manner of growth. *Dioscorides* describes it under the Greek name, which well explains the close ranges of its leaves, like an army. The name of *Water-aloe* is also appropriate. The flowering stem rises to the surface when in blossom, and

1. *Hydrocharis Morsus-ranæ*, *Frog-bit*.

Ponds, Britain.

1A *Stomas*, magnified.1B *Stamens*.2. *Stratiotes aloides*, *Water-Soldier*, or *Water-Aloe*.

Ponds, Britain.

2A *Stamens*.3. *Vallisneria spiralis*, *Spiral-stalked Vallisneria*.

Rhône.

3A *Stamen Flowers*.3B *Section of Ovary*.3C *Stamen Flower magnified*.4. *Boottia cordata*, *Heart-leaved Bootia*. Ava.4A *Pistils*.4B *Stamens*.4C *Stamens*, magnified.5A. *Anacharis alsinuatum*. Flower magnified.

until the seed ripens, when it again becomes immersed, and sends out fresh runners, prepared to bear new plants the following summer. As is usual with water-plants, when once located in a favourable situation, it increases rapidly. Since the extensive draining of the fens in the east of England, *Stratiotes* is becoming more rare in those districts. *Vallisneria spiralis* (3) was named in memory of a Professor at Padua, physician to Charles VI. It is one of the most remarkable plants of this tribe, being singularly adapted to the situations where it grows. It is chiefly found in the Rhone, whose waters rise with considerable rapidity from sudden floods. The stalks of the pistil flowers are long and spiral, and are thus enabled to rise and fall according to the level of the river. The stamen flowers are on short stalks, but detach themselves when fully grown, and float on the surface of the water, scattering the pollen: when the seeds are ripened, the spiral stalk again contracts, and carries down the capsule to bury its seeds in the mud. This process is similar to that which occurs in the spiral stalk of *Cyclamen* under different circumstances. Although the southern course of the Rhone is the principal habitation of *Vallisneria*, it grows also in the Languedoc Canal, and in the north of Italy. Some rivers of North America, of India, and of Australia, likewise shelter this curious plant. *V. alternifolia* grows near Madras and Calcutta, and in Silhet; *V. minor* has been discovered in the neighbourhood of Allahabad. *Boottia* (4) was first found by Dr. Wallich, on the banks of the Irawaddi, flowering profusely; the leaves and stalks are of a mucilaginous nature, and afford food to the Burmese, for which it is collected and sold in the markets of Ava. The leaves and fruit of *Enhalus* are also eatable, and its fibres are said to be capable of being woven. *Hydrilla verticillata* is used in India to cover sugar during the process of refining; but the useful properties of these plants are few. *Anacharis* (5) has been of late years introduced from North America, and has rapidly covered canals and small rivers in Cambridgeshire, to the great impediment of boats.

This Tribe inhabits fresh water in Europe, Asia, and North America. Two species of *Vallisneria* have been discovered in Australia.

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ALISMA CÆ.

THE WATER-PLANTAIN TRIBE.

AQUATIC or swamp plants, usually having perennial roots. The leaves are narrow or broad, of very cellular substance, always with parallel veins, often containing a milky juice. The flowers grow in umbels, racemes, or panicles, or are solitary, either purple, yellow, or white. The stamens and pistil are sometimes in different flowers. The calyx has three sepals, the petals are three; the stamens are of definite or indefinite number, the anthers turned inwards. The ovaries are superior, several, one-celled, free and distinct, or united into a single mass; the styles and stigmas of the same number as the ovaries. The fruit is dry, one, two, or many-seeded, either distinct and beaked, or united; the seeds are very minute, solitary, or numerous, and attached to the whole surface of the fruit: they contain no albumen.

This tribe has affinity with Hydrocharidaceæ.

Acrid bitter leaves and eatable fleshy roots belong to these plants.

Alisma, derived from the Celtic for water, is dispersed in Europe and America. *A. plantago* (1), although of a stiff manner of growth, is one of the most elegant of our aquatic plants, and the flowers are of a peculiar delicate texture and colour. The root is fibrous, from whence all the leaves proceed on erect long stalks; when growing in deep water, or in a flowing stream, the leaves are usually perfectly linear, a tendency which is observed in other water-plants. The roots are thought eatable by the Kalmucks, after the acrid juice is dispelled by drying. *A. ranunculoides* grows chiefly in swamps and turfy bogs: *A. natans* in the lakes of Cumberland and North Wales. *A. repens* is a native of South America, adorning the sandy shores of the river Manzanares. Sagittaria, named from the Latin, alluding to the form of the leaf, is a genus of considerable beauty, and is interesting as having given the type of one of the floral ornaments of architecture; its arrow-shaped leaf may be clearly traced amongst the sculptures of the choir of the noble

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| 1. <i>Alisma plantago</i> , <i>Water Plantain</i> .
Streams, England. | 3C <i>Section of Carpel</i> .
3D <i>Stamen</i> . |
| 1A <i>Seed-vessel</i> . | |
| 2. <i>Sagittaria sagittifolia</i> , <i>Common Arrow-head</i> .
Streams, England. | 4. <i>Limnocharis Humboldtii</i> , <i>Humbolt's Limno-</i>
<i>charis</i> . Streams, Brazil. |
| 2A <i>Stamen</i> . | 5. <i>Damasonium indicum</i> . East Indies. |
| 3. <i>Butomus umbellatus</i> , <i>Flowering Rush</i> .
Streams, England. | 6A. <i>Carpel of A. ranunculoides</i> .
6B <i>Section of Seed</i> . |
| 3A <i>Pistils</i> . 3B <i>Carpel</i> . | 7A. <i>Seed-vessel of L. Plumierii</i> .
7B <i>Section of Seed</i> . |

cathedraï of Rheims. *S. sagittifolia* (2) is very frequent in streams, usually associated with *Alisma*, and like several other aquatics, widely spread in the world, being equally suited to the temperature of Europe, Siberia, China, Japan, and Virginia. In the warmer climate of China it becomes of more value than with us, the roots attaining such dimensions as to afford an useful supply of food. *S. sinensis* is a species with wider leaves, and the flowers are pure white, without a purple spot. *S. echinocarpa* of Brazil is remarkable for its prickly seeds; some Brazilian species are very astringent, and the juice is used for making ink. *Butomus umbellatus* (3) was by Gerarde (one of the first who described our native plants) declared to be "of all others the fairest and most pleasant to behold;" the umbel of rose-coloured flowers, when in full bloom, about Midsummer, in small rivers, is well deserving of admiration. The leaves are very rough at the edges, usually twisted at the top. Although the plant generally is acrid and bitter, like *Alisma*, yet the root and seeds are sometimes roasted and eaten by the poor peasants of Sweden, as well as the natives of Northern Asia. In former times they were used medicinally for their emollient cooling properties. *Actinocarpus* differs from *Alisma* principally in the stellate form of the capsules. *A. Damasonium* is a native of our streams and ditches; *A. minor* of New South Wales. *Damasonium indicum* (5) is found growing along the edges of streams in the valleys of the Himalaya, and in many other parts of India, mingled with various aquatic plants, which belong both to Southern India and Europe, the more uniform temperature of water favouring this combination in a degree beyond the effect of any local atmosphere in dry situations. *Limnocharis* (4), from the Greek, denoting its marsh habitation, is a beautiful plant, and flourishes perfectly in our conservatories; the leaves have a remarkable pore at the point by which the superfluous moisture is carried off. The texture of both leaves and petals is extremely delicate and transparent.

These plants chiefly grow in the streams and marshes of the northern countries of the world, but several species inhabit the Tropics; *Limnocharis* is peculiar to those regions. *Sagittaria* is very widely dispersed.



ORCHIDACEÆ.

THE ORCHIS TRIBE.

SHRUBS and herbaceous plants, all perennial; terrestrial, or aerial fixed on trees and stones. The roots are fibrous or fleshy, like tubers full of starch. The stem is either long and annual, or woody and perennial, forming jointed branches. The leaves are flat or round, sometimes growing one over the other like Iris; generally sheathing, membranous, coriaceous or hard, never lobed, occasionally bordered by cartilaginous teeth, veins parallel. The flowers are irregular in form, solitary, clustered, spiked, or paniced; a single bract at their base. The corolla is adherent, herbaceous or coloured, membranous or fleshy, the sepals are three, petals three, one developed into a lip of very differing form, horned, or furnished with various appendages, occasionally moving spontaneously as in *Bolbophyllum*. The stamens and style are consolidated into a column; of the three stamens the central one only is perfect, except in *Cypripedium*, where the two side anthers are perfect, the central one imperfect. The anthers are erect at the top of the column, or turned flat upon it, the pollen powdery or waxy. The ovary is formed of six carpels, three of which bear stigmas, and three have double plates bearing numerous minute seeds. The style is rarely distinct except in *Cypripedium*. The capsule, seldom fleshy, usually separating into six dry, woody, rigid valves; seeds, with a loose netted skin, rarely a hard crustaceous covering, and sometimes expanded into a circular wing. They contain no albumen.

This Tribe has affinity with *Zingiberaceæ* and *Iridaceæ*.

The starchy roots of some, and the aromatic capsules of *Vanilla* are the chief useful parts.

Orchis, the old Greek name, denotes a remarkable genus which has been taken as the type of an extensive natural Order of exceedingly interesting plants, of late years chiefly discovered and brought forth out of uninhabited forests to display their varied forms of marvellous beauty to the gaze of man. Several exhibit a tendency to the shape and colours of insects, as is clearly perceptible in many English species:

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| 1. <i>Orchis mascula</i> , <i>Early Purple Orchis</i> .
Woods, England. | 4. <i>Sobralia macrantha</i> .
Guatemala. |
| 1A <i>Column with Pistil and Anthers</i> . | 5. <i>Phalænopsis amabile</i> .
Manilla. |
| 2. <i>Ophrys apifera</i> , <i>Bee Orchis</i> .
England. | 6. <i>Dendrobium fimbriatum</i> .
East Indies. |
| 2A <i>Seed-vessel</i> .
2B <i>Seed, magnified</i> . | 7. <i>Huntleya violacea</i> .
Guiana. |
| 2C <i>Section of Seed-vessel</i> . | 8. <i>Vanilla planifolium</i> .
8A <i>Seed magnified 200</i> . |
| 3. <i>Oncidium Papilio</i> .
Trinidad. | 9A. <i>Epipactis grandiflora</i> .
<i>Flower</i> . |

Ophrys apifera (2), *O. aranifera* and others. But it is in the heat and moisture of Tropical woods that the most curious examples are to be found, especially those which are capable of growth without earth, deriving nourishment solely from the air. *Orchis mascula* (1) is frequent in groves and shaded meadows; the roots contain a supply of wholesome starchy substance, made into a nourishing food called *salep*, after an Arabic name. *O. foliosa* of Madeira resembles our *O. latifolia*, but is much taller, the leafy spike being a foot long. *O. canariensis*, in the valley of Orotava in Teneriffe, is the most southern example of the genus. One of the most rare of British Orchids is *Cypripedium calceolus*, the Ladies' Slipper, now only occasionally found in its former localities of Arncliffe, and Ingleborough in Yorkshire. This genus is remarkable as having on the column two perfect side anthers, instead of one terminal as in other genera. The lip is expanded into a hollow pouch, and all the peculiarities of the genus are shown as clearly as in *C. insigne* of Nepal, or in the North American species. *Epipactis grandiflora* is a beautiful English species, the cream-coloured flowers (9) growing on a tall spike. In the primeval forests of Brazil *Oncidium* abounds, the flowers generally produced on very long stalks, usually of a pale yellow, marked with brown. *O. papilio* (3) has a striking resemblance to a butterfly resting on the slender stalk. *Sobralia* is a stately genus, rising with a reed-like stem bearing stiff plaited leaves, and noble fragrant flowers: the lip is folded around the column. *S. macrantha* (4) is the finest species. *S. liliastrum* adorns hot dry rocks in Bahia with its white and yellow flowers. *Phalænopsis* (5), with its fair flowers having the aspect of a moth, is an extremely elegant plant. Of East Indian Orchids *Dendrobium* is one of the finest; *D. fimbriatum* (6) of a pure tint; other species marked with dark brown; *D. cærulescens*, at 4000 feet on the mountains of Khosea, bears forty flowers on its stem. Among the countless plants which struggle for space on the small islands of the Berbice and Essequibo, *Huntleya violacea* (7) was discovered by Sir Robert Schomburgk, covering gigantic trees in the humid air from the spray of cataracts, where the sun scarcely penetrates. *Cattleya superba* of Guiana is unsurpassed for beauty, fragrance, and duration; *Schomburgkia crispa* is also a graceful species of that country; *S. marginata* belongs to Surinam. *Galeandra* grows six feet high, in large clusters, on the Mauritia palm. Of the East Indian plants of this tribe *Cymbidium*, *Cœlogyne*, *Ærides*, *Camarotis*, and *Phaius* are amongst the most remarkable in variety of form and hue, and manner of growth. *Cynoches* of Mexico and Demerara has a long bent column with a dark knob at the end. *Epidendrum vitellinum* unfolds its spikes of brilliant scarlet flowers in a temperate climate at 9000 feet elevation on the mountains of Mexico. On the margins of pools at the base of the Table Mountain of the Cape, *Disa grandiflora* opens its crimson flowers, when the hot mists succeed to the frosts and drought. The long seed-vessels of *Vanilla* (8) are used to flavour chocolate.

This Tribe is dispersed almost in all countries, except in the coldest regions, or the dry parts of Africa. In the hot damp regions of the East and West Indies and South America the species with aerial roots abound. Many belong to Central America and the Cape of Good Hope, as well as to Australia and Europe.



The Ginger Tree



ZINGIBERACEÆ.

THE GINGER TRIBE.

HERBACEOUS plants with creeping jointed root-stalks; the stem is formed of the united bases of the leaves, usually single, and sometimes branching. The leaves are simple, sheathing at the base, with a single mid-rib, and numerous fine veins diverging to the edge. The flowers arise from amongst membranous bracts, usually in pairs. The calyx is above the ovary, tubular, three-lobed, short; the corolla is tubular, irregular, six-parted, in two rows, one petal usually larger than the rest, often three-lobed. The stamens are three, the central one only perfect. The filament is often extended beyond the anther, sometimes petal-like; the anther is one or two-celled, opening longitudinally, its lobes often enclosing the upper part of the style, sometimes spurred. The ovary is one to three-celled, the style slender, or expanded. The stigma dilated, hollow, or hooded. The fruit is usually a capsule, three-celled, many-seeded, or imperfect and one-celled, occasionally a berry. The seeds are round or angular, with or without an aril; they contain mealy albumen.

In some points of structure this Tribe resembles Musacæ, and it has also affinity with Orchidacæ.

The roots of Zingiber are aromatic and pungent, others contain a large portion of wholesome starchy substance.

Zingiber is derived from the Indian name of the plant, and so likewise are all the European appellations. The root of Zingiber *officinale*, ginger (1), is known and esteemed in all countries as a medicine and condiment. In the West Indies the plants are cultivated in trenches, and there frequently eaten in a fresh state as salad. If the roots are required for preserving in sugar, they are taken up at about two months growth, but to be dried as a spice they remain in the ground until the stems are withered, when they are taken out and scraped and carefully dried in the sun, for what is commonly called white ginger. The kind, called black ginger, is boiled, which disperses the oil contained in the roots, and causes them to acquire a dark colour. A large quantity of both sorts, as well as the

1. Zingiber <i>officinale</i> , Ginger.	East Indies.	2A Ovary and Pistil.
1A Calyx and outer Petals.		
1B Ovary and Pistil.		
2. Hedychium <i>speciosum</i> , Splendid Hedychium.	East Indies.	3. Alpinia <i>Cardamomum</i> , Cardamoms.
		East Indies.
		3A Seed-vessel. 3B Section.
		4A. Mantisia <i>saltatoria</i> . Flower. E. Indies.
		N N

preserved kind, is prepared in the East and West Indies and sent thence to parts of the world. Several other species are natives of the East Indies, *Z. mioga* belongs to Japan. The beautiful genus *Hedychium* is exclusively native of the East Indies, China, and the Malay islands; it appears to extend westwards as far as 30° N. lat. in Western Hindustan; being found at intermediate stations along the shores of the Irawaddy, in Assam, in the mountain valleys of Sikkim and Nepal. In Malabar also some species exist, and on the hills in the interior. *H. speciosum* (2) is like other species, liable to great diversity of colour and even growth, but it is one of the most fragrant and graceful of the genus, noble in general aspect, and extremely elegant in the form and arrangement of the flowers. The plant is as much as five feet in height in our conservatories, and probably attains to greater magnitude in its native situations. The scent is delicious, and as the flowers expand gradually, it remains many days extremely ornamental, yet it is much less frequent in conservatories than it deserves to be. On the Himalaya it has been found at 6000 feet elevation. *H. coronarium*, generally known as the garland-flower in India, has white flowers, producing them abundantly throughout the summer in the gardens of Bengal, where the flowers are used as ornaments for the head. *H. spicatum* is one of the most common species in Nepal. *Alpinia cardamomum* (3) was valued in ancient times by Hindoos, Persians, and Arabians, for its aromatic seeds; they still form an important article of commerce, 15,000 lbs. weight being annually sold in London. It grows plentifully on the mountains of Malabar, and the gathering and packing the seeds occupies native women and children from October till December. Several other species yield equally valuable seeds, in Ceylon and other parts of India. The genus *Curcuma* is known by the horns on the anther; the root of *C. longa* is Turmeric, a chief ingredient in Curry powder, and a constant article of food in the East. *Kœmpferia galanga* is the medicinal Galangale, of pleasant aromatic flavour. *K. candida* is the finest species in regard to its flower, but the root is not valuable. Of that class of this Tribe which has wholesome though tasteless roots, *Maranta* is the principal, yielding arrow-root in great abundance. *Canna*, the Indian Shot, has also roots full of starch. The strangely-formed flowers of *Mantisia* (4) resemble an insect in shape, and seem to connect this Tribe with the Orchids.

This Tribe belongs almost exclusively to the Tropics, most abundant in the East Indies; rare in Africa and America.



Diplazium elaeagnifolium
Lamour.

as Wheat. Throughout the Tropics the Banana or Plantain is the principal source of food, wholesome and pleasant in flavour; it ripens in conservatories in England, but does not acquire its full development and nourishing properties; when grown in hot regions it has so much saccharine matter that it dries like figs, and may be kept for many years. Boiled or roasted, it is eaten like bread, when ripe it may be preserved as a sweetmeat; a kind of wine is sometimes prepared from it, and the young shoots are eaten as a vegetable. *M. textilis* is the Manilla hemp, from which an excellent fibre is obtained not only for ropes, but of a quality fine enough for the most delicate of Indian muslins. *Strelitzia* (2) was named by Sir Joseph Banks in honour of Queen Charlotte of Mecklenburgh Strelitz. It is a genus of singular form and remarkable beauty; the leaves grow direct from the root, forming a kind of stem by their sheathing bases, in the midst of which springs the flower-stalk, terminating in a spathe, from whence rises the brilliant crest of flame-coloured flowers. The three inner petals are deep blue, enclosing the stamens and pistil. *S. angusta* is eighteen feet high, with white flowers. *Heliconia* is a nearly similar genus, belonging to the West Indies; *H. psittacorum* is a beautiful object in the clearings amongst the mountains of Jamaica, the graceful flexile stem bearing clusters of flowers at the joints towards the summit, the orange petals marked by a black spot have a singular effect. *H. Bihai* is a larger species flourishing in moist shaded valleys; the small succulent berries, containing three rugged seeds, are eatable. *Urania speciosa*, a noble, Palm-like tree of Madagasear, has wholesome seeds, enveloped in a blue pulpy aril, full of an essential oil. The fruit is used in dyeing.

This Tribe inhabits chiefly the Cape of Good Hope, and the islands on its south-eastern coast, and is dispersed over the Tropics, principally on plains. It is scarcely found elsewhere, except in Japan.

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HEMODORACEÆ.

mountain of Roraimé, and on Itapu, which rises like a gigantic obelisk 4000 feet above the savannahs of Guiana, in 5° north latitude, where the temperature ranges between 60° and 86°. The stem is from ten to twelve feet high, the forks of the branches clothed with the membranous withered bases of leaves. The scent of the flowers is extremely fragrant, similar to that of *Hippeastrum*, allied to *Amaryllis*. But the most extraordinary plant of this tribe is undoubtedly *Vellozia*, discovered and described by the celebrated Bavarian traveller, Von Martius, in Brazil. The trunk consists of a central cylindrical column, not increasing in diameter, only growing upwards like other monocotyledonous plants. The exterior of the stem is composed of quantities of slender fibrous roots, cohering and forming a kind of wood of the same nature as that of the ferns, and partly resembling that of some Palms. At the top the branches grow in forks, from the ends of which proceed tufts of leaves and flowers, after the manner of *Yucca*. As they grow always in numerous groups, the effect is very singular. A few other genera are worthy of notice; *Dilatris* is always extremely downy over the whole flowering stem: *D. corymbosa* and *D. viscosa* belong to the Cape. *D. Heritiera* yields a red dye to the natives of North America. *Lachnanthes tinctoria* affords also a red dyeing matter. An infusion of *Aletris farinosa* is one of the most intense bitters known, and is used occasionally as a tonic medicine.

This Tribe exists chiefly in Brazil and the Mascaren Isles, in Guiana, and in the Temperate parts of Australia; a few species are found in North America, and at the Cape.

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AMARYLLIDACEÆ.

Although of very different and lowly aspect, the simple Snowdrop (2) is one of the most admired and cherished of flowers. *Alströmeria* (3), named after a Swedish baron, has a remarkable character in the leaves being placed on the stem with the under surface uppermost, which causes them to twist, in order to bring the porous side to the light and air. The roots of *A. pallida* and others contain starch, from which a kind of arrow-root is prepared in Chile. *A. Salsilla* yields a considerable supply of food in the West Indies. *Hæmanthus* (4) produces its singular involuere, enclosing numerous flowers, before the leaves. Several species belong to the Cape, and it is said that the Hottentots use the poisonous juice of the bulbs of *H. toxicarius* to poison their arrows. The fruit of *Hæmanthus*, when ripe, is the size of a small cherry. *Sternbergia lutea* (5) abounds in the south of Europe and in Palestine: some travellers suppose it to be the "Lily of the field," which Divine wisdom declared to surpass in dazzling splendour the array of the most glorious of kings. *Phycella ignea* (6) is one of the brilliant productions of Chile. The genus *Narcissus* is of interest as being one of the few which extend into Europe; many species are found in the southern countries. *N. pseudo-narcissus*, the Daffodil, is occasionally seen wild in England: *N. moschatus* (7) is one of the various species of Spain. The peculiar character of the flowers is the elegant cup or crown within the petals; in some it is shallow, in others tubular, beautifully curled at the rim. Nearly all come forth in the spring, and for their bright golden hues, or pure white, as well as delicious fragrance, are highly esteemed. The most celebrated plant of this Tribe is the Aloe, *Agave Americana*. In its native country it forms impenetrable hedges with its solid leaves, bordered with strong spines; a single plant will spread its leaves to a circumference of eighteen feet. But the chief value is derived from the sap, which exudes when the young bud is cut off; and when fermented, becomes the favourite *pulque* of the Mexicans: they also prepare paper from the fibres. *Littæa geminiflora* has a stem like an Aloe, thirty-five feet high, with grass-like leaves at the base. Another lofty plant is *Doryanthes excelsa*; the straight stem clothed with small leaves, surrounded by a head of crimson flowers. *Crinum* and *Pancratium* are natives of India, with elegant white flowers. *Hippeastrum*, the *Knight's-star* of Brazil, appears there in countless numbers. *Fourcroya* attains an extreme height of flower-stem, with rapid growth.

This Tribe exists in greatest abundance and variety at the Cape. Some species are plentiful in South America, particularly in Brazil; others abound in the East and West Indies: a few have been discovered in Australia.

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IRIDACEÆ.

root; their sweet scent was formerly valued in the manufacture of hair-powder. *Tigridia pavonia* (3) is an extremely brilliant but ephemeral flower, enduring only for a day: the chief peculiarity of its structure is the long tube formed by the united filaments of the stamens at the top; the three anthers surround the triple stigma. Although a native of the hot climate of Mexico, the Tiger-flower flourishes well in the open air here, if placed in a sheltered and sunny situation. *T. conchiflora* belongs also to Mexico; the petals are of a deep yellow colour. *Sparaxis tricolor* (4) is one of the numerous beautiful bulbous-rooted plants of the Cape of Good Hope; the Greek name alludes to the torn spathes of the flower.

Amongst the most striking of these flowers may be classed *Gladiolus*, so named from the Latin, on account of the sword-shaped leaves, though this is common to other plants of the Tribe. *G. communis* and *G. segetum* adorn the fields of South Europe. *G. byzantium* is a native of Turkey; the rest all belong to the Cape, and are more or less ornamental. *G. psittacina* (5) is a brilliant example of the Flora of Natal, of noble form, and harmonious in colouring. But the most useful plant must be considered the lowly *Crocus* (6), which is not only the chief embellishment of gardens in the earliest spring, but is valuable for the supply of Saffron obtained from the large stigmas of *C. sativus*. When the Saffron *Crocus* was first introduced in the reign of Edward III., it was extensively grown around Saffron Walden, in Essex, but its use, and consequently its cultivation, are much diminished. The colouring ingredient of Saffron has the peculiar quality of total dispersion by the sun. The starchy tubers of some of the Cape plants are said to afford food to the Hottentots; and the roasted seeds of *Iris pseudo-acorus* may be a substitute for coffee. *Ixia*, *Moræa*, *Sisyrinchium*, and other genera, have been contributed to European gardens from the Cape, whose dry sands are the grand store of the most delicate and brilliant flowered bulbous plants in the great class of monocotyledons.

This Tribe is most abundant in South Africa, and in the central regions of North America and of Europe. A few species only are natives of the Tropics; few also are found in South America. *Crocus* belongs entirely to Europe and Asia; the African and Australian species are not known in America.

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Ananas comosus
Pineapple

J. & W. Lloyd

BROMELIACEÆ.

to mere bracts, and thus the whole is consolidated into the juicy pulpy fruit. The crown is the upper tuft of leaves, a continuation of the plant after the flower-buds cease. In Singapore the fibres of the leaves are manufactured into fine muslin. *B. pinguin* in its wild state bears a small acid fruit (†), used medicinally in the West Indies; this species grows parasitically on trees in Brazil, spreading over a space of twelve feet, and covered with mosses and other small plants. *Æchmea discolor* (2) is one of the most beautiful plants of this Tribe, introduced lately from Brazil; it forms a brilliant addition to the conservatory, the coral-like branches remaining long in flower. The most striking genus, when seen in its native countries, is *Tillandsia*; some species grow parasitically on trees in Peru and Brazil, almost concealing them with thin masses of pale grey foliage and spikes of bright flowers. *T. usneoides* clothes the trees in many parts of Tropical America with its long silvery branches and leaves, in the same manner as the Lichen *Usnea* hangs like a grey beard on the Firs of the Alps. Another kind ascends into the temperate climate of the mountains of Mexico. *T. acaulis* (3) is well adapted for cultivation amongst our exotics, being of more lowly form; the leaves are hollowed at the base, and retain rain and dew in sufficient quantity to be valuable to travellers in the season of drought. From the spike of *Puya lanuginosa* flows a transparent gum; *P. chilensis* yields a juice found useful in healing wounds in Chile. From the root of *Bilbergia tinctoria* a yellow dye is obtained in Brazil. Several species which can exist without earth are used to adorn balustrades and balconies in South America, scenting the air with their delicious fragrance.

All the plants of this Tribe are natives of America, whence they have extended eastward; and many have become indigenous on the west of Africa, and in the East Indies.

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Dioscoreaceae
the Yam Tribe

Day & Son, London

DIOSCORACEÆ.

THE YAM TRIBE.

TWIXING shrubs, having large tubers above or below the ground. The leaves are alternate, or occasionally opposite, with netted veins. The flowers are small, spiked, with from one to three bracts. The stamens and pistil are in separate flowers. The calyx and corolla are united, herbaceous, adherent. The stamens are six, inserted into the base of the sepals and petals. The anthers are turned inwards and burst lengthwise. The ovary is three-celled, with one or two seeds in each cell. The style is deeply three-cleft. The fruit is a capsule or a berry, leafy or compressed, or succulent. The seeds of the capsule are flattened, winged or wingless, those of the berry round; they contain cartilaginous albumen, in a cavity of which lies the embryo.

This Tribe has affinity with Smilacæ.

An acrid principle exists generally in these plants.

Dioscorea records the name of the celebrated Greek physician and botanist, Dioscorides. It is an important genus, yielding an abundant supply of nutriment in its farinaceous tubers: *D. sativa* is the common Yam, cultivated as the chief food of Negroes in Africa and the West Indies. The acrid juice is entirely expelled by heat, and the mealy tubers are excellent, either roasted or boiled. The flour is also made into cakes and bread. *D. aculeata* is a variety cultivated in all the islands of the torrid zone, as well as in New Zealand. The buds of the tubers are planted like those of the potato, and require very little care afterwards, producing plentiful crops. *D. triphylla* (1) is of a noxious nature, and the tubers contain too much acrid principle to be made available for food. *D. versicolor* is one of the many species common in India, in the valleys, and ascending as high as 5000 feet on the Himalayas. *D. alata*, the most frequently cultivated in northern India, displays in its stem very distinctly the peculiar arrangement of wedges of the wood placed against the bark, which, when dried, easily separate, like those of *Aristolochia* and *Menispermum*. The varieties of *Dioscorea* in the East have attracted the attention of all botanical travellers. Rumphius describes some with

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| 1. <i>Dioscorea triphylla</i> , <i>Three-leaved Yam</i> .
Malabar. | 3. <i>Tamus communis</i> , <i>Black Bryony</i> .
Hedges, England. |
| 1A <i>Pistil Flower</i> , magnified. | 3A <i>Stamen Flower</i> . 3B <i>Pistil Flower</i> . |
| 1B <i>Seed</i> , magnified. | 3C <i>Pistil</i> . 3D <i>Section of Ovary</i> . |
| 2. <i>Testitudinaria elephantipes</i> , <i>Elephant's-foot</i> .
Cape of Good Hope. | 4A. <i>Dioscorea adenocarpa</i> .
<i>Section of Stamen Flower</i> . |
| 2A <i>Pistil Flower</i> . | 4B <i>Seed</i> , magnified. 4C <i>Seed-vessel</i> , open. |

DIOSCORACEÆ.

spreading branched tubers, others twisted like a snake. The size and weight vary extremely; some not more than a pound in weight, others as much as a foot broad. *D. atro-purpurea* is extensively grown in Malacca and the isles of the Indian Archipelago. *D. bulbifera* is the Yam of Otaheite; at the base of the leaf-stalks are small bulbs, containing the germ of new plants. *Testitudinaria* (2) was so named because of the root having the appearance of the shell of the tortoise. This singular root-stock grows to an immense size in favourable localities, and contains a farinaceous substance used by the Hottentots as food in time of scarcity, whence it is commonly called Hottentot's bread. It grows readily in a conservatory, and has a remarkable appearance, the extremely slender stems rising out of the rugged mass, and climbing to a considerable height over some support. *Tamus communis* (3) is of some interest, as being the only European example of this Tribe of plants. It is frequently seen in this country climbing with twining stems without tendrils, over hedges and bushes in woods and groves, adorning them in spring with its delicate pale-green flowers, and with its bright red berries in autumn. On the roots are large dark excrescences, of such acrid properties that they have been used as blisters; the roots themselves contain a white starchy substance of a wholesome nature; the young shoots are mild, and are eaten by the Moors with oil and salt. *Rayania* was named after the learned naturalist Ray; the genus belongs chiefly to the West Indies, a graceful twining plant, like the rest, with drooping clusters of winged capsules, bearing one seed each. *Oncus esculentus* of Cochín-China has eatable tubers.

The numerous species of this Tribe are found exclusively in the Tropics, excepting *Tamus*, which is a native of the Temperate parts of Asia, and of Europe.

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S M I L A C E Æ.

THE SARSAPARILLA TRIBE.

HERBACEOUS plants, and undershrubs partly climbing, sometimes having fleshy tubers. The leaves have netted veins. The stamens and pistils are sometimes in separate flowers. The calyx and petals are similar, free, six-parted; the stamens are six, inserted near the base of the corolla, seldom placed below the ovary. The ovary is three-celled, the cells one or many-seeded, the style usually trifid, bearing three stigmas. The fruit is a roundish berry, containing seeds, with fleshy cartilaginous albumen.

This Tribe has affinity with Liliaceæ, but is distinguished by the netted veins of the leaves, and the fruit being a rounded berry.

Astringent properties exist in the roots of some of these plants.

Smilax has often a tough prickly stem, whence the Greek name was derived. *S. Sarsaparilla* of North America has long, slender, white roots, covered with a wrinkled brown bark. They are of a mucilaginous nature, and slightly bitter taste, and are considered valuable as a medicine in America and in England. *S. maculata* (1) is one of the various species which belong to the Himalayas, and is found in Nepal, Kemaon, and on Mussoree. On the Silhet mountains grow *S. oxyphylla*, *S. lanceæfolia*, and *S. Roxburghiana*, all employed by the natives medicinally. *S. prolifera* is a native of Bengal, and *S. ovalifolia* extends across the Peninsula, towards Bombay. Although the different species of Smilax exist in the greatest abundance in the tropical parts of Asia, Africa, and America, yet some are dispersed in cooler regions; *S. aspera* grows in Syria, *S. mauritanica* in the north of Africa, *S. catalonica* and *S. nigra* in Spain. All have more or less tuberous roots, possessing useful medicinal properties; those of *S. China* are probably the largest, twisted and full of knots; they afford food and medicine to the Chinese. *S. glycyphylla* is imported largely from Australia, where it is called *sweet Tea*, and is thought to be extremely wholesome. None of the species

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| 1. <i>Smilax maculata</i> , <i>Spotted Sarsaparilla</i> .
Himalaya. | 5. <i>Trillium sessile</i> , <i>Stalkless-leaved Trillium</i> .
North America. |
| 2. <i>Ruscus aculeatus</i> , <i>Butcher's Broom</i> .
England. | 6. <i>Polygonatum multiflorum</i> , <i>Solomon's Seal</i> .
England. |
| 2A <i>Leaf and Flower magnified</i> . | 7A. <i>S. glycyphylla</i> . <i>Stamen Flower</i> . |
| 3. <i>Convallaria majalis</i> , <i>Lily of the Valley</i> .
Woods, England. | 7B <i>Pistil Flower</i> . 7C <i>Section of Ovary</i> . |
| | 7D <i>Seed</i> . 7E <i>Section</i> . |
| 4. <i>Paris quadrifolia</i> , <i>Herb Paris</i> .
Woods, England. | 8A. <i>S. brasiliensis</i> . <i>Flower</i> .
8B <i>Section of Ovary</i> . |

have much beauty of flower, but *S. aspera* and *S. excelsa* present a striking appearance when they droop from the summits of tall trees, with their slender branches covered with red berries in autumn. The English name was given to *Ruscus aculeatus* (2) because butchers used the branches for cleansing their blocks; the Italians still make brooms of it. The root is perennial, but the shrub withers the second year after flowering; it is of a very rigid nature, the leaves tipped with a sharp spine. The small flower appears to grow on the leaf, but is really on a short stalk which lies beneath the outer coat of the leaf; the fruit is a red berry of sweetish flavour, and contains one or two seeds. *Convallaria majalis* (3), the Lily of the Valley, may be considered one of the most choice plants of our British Flora, graceful and simple in form and colour, and very agreeably fragrant; it is now found only in a few localities in this country, for many of the once suitable woods are cleared, and become open fields. In the wooded parts of the Craven district of Yorkshire, the Lily of the Valley still flourishes luxuriantly, and is particularly abundant in the woods of the Vale of Arneliffe. This is one of the plants which is not to be improved by the skill of the cultivator, but is perfect in its natural condition. A durable green colour may be prepared from the leaves with lime. *Paris quadrifolia* (4), a remarkable plant, easily distinguished from all others, is rare in this country, scarcely found except in woods in Yorkshire, and a few other northern localities. The roots are said to have emetic properties, and narcotic juices prevail in the plant, although in slight degree. *P. polyphylla* is a native of Nepal. *Convallaria* and *Paris* occur together in the same localities in India, as in England. *Trillium sessile* (5), named from the triple division of its parts, was brought to England nearly a century ago, but is rarely to be seen in our gardens, being of slow growth and difficult to cultivate; yet its singularity renders it worthy of attention. The juice, when combined with alum, yields a blue dye. *Polygonatum* received its English name from an imagined resemblance in the twisted roots to the celebrated Seal of Solomon. *P. multiflorum* (6) is an exceedingly elegant species, adorning shady plantations and copses in May and June; this and another English species, *P. verticillatum*, are found also on the Himalaya. Several others are natives of Germany and North America. *P. oppositifolium* belongs to Nepal. *Streptopus*, with its twisted flower-stalks, has one species in Hungary, others in North America. *Smilacina bifolia* is found in Northern Europe, the rest in North America. There also is found *Medeola virginica*, which, like others of this Tribe, has an emetic root. *Ophiogon* is the Snake's-head of Japan and China. *Asparagus*, and *Dracæna* the Dragon-tree, both belong to this Order.

This Tribe is dispersed in small numbers in most parts of the world: in the woods of the Temperate regions of Europe, Asia, and North America. *Smilax* is found chiefly in the Tropics of Asia and America.

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Lilium
The Lily Tribe

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species is *F. imperialis* of Persia, the Crown-imperial, which displays its red and yellow coronet of pendent flowers in early spring. Nearly three centuries ago, the first Persian tulips were brought to England from Constantinople; but not until the close of the seventeenth century had the cultivation attained its height in Holland and England, or a single bulb its extravagant price of 500*l*. *T. gesneriana* is the original of the countless varieties. *T. sylvestris* (5) is interesting as the solitary British example, on the northern limits of the genus. *T. suaveolens*, the Van Thol, comes forth with the first spring in the south of Europe. A rival in value and estimation is *Hyacinthus orientalis*; at Haarlem 2000 varieties were known during its extreme popularity: in fragrance and beauty the Hyacinth has surpassing claims for admiration. *Scilla nutans* (6) is frequent in woods and under hedges, in many parts of England and on the Continent; *S. bifolia* grows in similar situations. *S. autumnalis* on dry commons in autumn; *S. sibirica* is the most northern species. *Agapanthus* is well known as the blue African Lily. *Ornithogalum*, the Star of Bethlehem, has several species in England; it is found also in California, Egypt, and at the Cape. The only useful species is *O. squilla*, the medicinal Squill, the bulb of which is very large, and the stem, bearing a fine spike of white flowers, is often two feet high. In ancient times a classical fame was attached to *Asphodelus*, abounding in Greece, where it now affords food to sheep. One of the latest discoveries in this tribe is *Chrysobactron*, with brilliant yellow flowers in Lord Auckland's Isle. *Yucca* has a grand appearance, when the tall spike of graceful pale flowers rises out of the tuft of rigid leaves. *Aloe*, a genus almost confined to the Cape, affords a valuable medicine in the dried juice of the leaves of the shrubby species, the fibres are made into cordage and coarse cloth. But the most valuable material for cables and strong ropes is obtained from the leaves of *Phormium tenax* of New Zealand, now becoming of very extensive importance. Another remarkable plant belongs to Australia, *Xanthorrhæa*, the grass-plant; on the summit of a tall palm-like stem covered with the remains of sheathing leaf-stalks is a tuft of long wiry leaves, from the centre of which springs the tall close spike of flowers like a bulrush. The inner part of the leaf-bud is eaten by the natives, who esteem the balsamic flavour caused by the gum-resin: this singular plant forms a link with Rushes, thus connecting one of the most highly developed with one of the humblest tribes. From the earliest times a wholesome condiment to food has been derived from *Allium*, yielding Garlic, Onions, Leeks, Chives, all possessing strongly-scented hot properties, of great value to man in all climates.

This extensive Tribe is widely dispersed; most abundant in Temperate regions, frequent in Australia and at the Cape of Good Hope, rare in the East Indies. The Tropical species are chiefly arborescent.

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COLCHICACEÆ.

THE COLCHICUM TRIBE.

HERBACEOUS plants, having bulbous, tuberous, or fibrous roots; some are stemless, some have branching or simple stems. The flowers are usually purple, white, or green. The calyx and corolla are similar, free, petal-like, in six divisions, or by partial adhesion tubular. The stamens are six, the anthers turned outwards. The ovary is three-celled, the style three-parted, the stigmas undivided; the capsule generally separable into three parts. The seeds are numerous, with a membranous covering, and contain dense albumen.

This Tribe has close affinity with Liliaceæ, but is known by the anthers turning outwards, and the three-parted capsule.

Highly poisonous properties exist in these plants.

Colchicum is said by Dioscorides to have derived its name from Colchis, where it grew abundantly. It is one of those plants which produce flowers before leaves, a process only to be effected by perennial trees, or bulbous or tuberous-rooted plants, and most frequently by the latter. The new plant springs from the side of the root, the upper portion of the spathe or sheath rises out of the ground, and from it emerge three or more flowers in the month of September. After the slender-tubed flowers droop and wither, the seed-vessels lie dormant underground until the following spring, when they grow upwards and the seeds are enabled to ripen, which cannot be accomplished in the earth. A few simple leaves come forth at the same period, and then a pause occurs till the autumnal flowering. As a medicine, Colchicum was known in the time of Hippocrates, and it is still used as a valuable remedy in rheumatism and other illness. *C. autumnale* (1) is frequent in the moist meadows of various parts of England. *C. variegatum* is the species common in Greece, and in our gardens. *Melanthium* is a genus belonging to the Cape of Good Hope; *M. junceum* (2) has rush-like leaves proceeding from the bulbous root; on the claw of the petal are two glands, full of honey; this was one of the

1. *Colchicum autumnale*, *Meadow Saffron*.
England.

1A *Ovary and Pistil*.
1B *Section of Ovary*.

2. *Melanthium junceum*, *Rush-leaved Melanthium*.
Cape of Good Hope.
2A *Stamen and Petal*. 2B *Seed-vessel*.
2C *Seed-vessel of M. uniflorum*.

3. *Kreysigia Cunninghami*, *Cunningham's Kreysigia*.
New Holland.

3A *Stamen and Pistil*.
3B *Ovary and Pistil*.

4. *Veratrum nigrum*, *Dark-flowered Veratrum*.
Siberia.

4A *Stamens and Ovaries*.

COLCHICACEÆ.

first species brought to England. *M. cucomoides* is a dwarf species: the flowers are seated in the midst of wide leaves; each petal is folded at the base into a tube, from which the large anther protrudes. *Veratrum*, said to be named from the black root, contains an alkaline principle called Veratrine, similar to that which exists in *Colchicum*. *V. nigrum* (†) grows to the height of four or five feet, bearing a branching panicle of flowers, the large leaves clustering around the base of the stem, forming a handsome object in the garden. It has less powerful qualities than *V. alum*, which is used medicinally, although, in large quantities, poisonous. The virulence of the poisonous juice of these plants appears to differ in various seasons, for it is said that in the poor districts of Europe the peasants eat the roots of *Colchicum*, when boiled, in autumn. A few years ago, a poor woman in Covent Garden market mistook some *Colchicum* roots for onions, and eating them, was poisoned. *Kreysigia Cunninghamia* (‡), named after two enterprising travellers in Australia, is one of the numerous beautiful plants added to our stores from that country; the honey-glands are like those of *Parnassia*. *Bulbocodium*, so called from the rough, woolly covering of the bulb, produces its purple flowers, much resembling *Colchicum*, in the spring season, in Spain. *Uvularia* is a genus of North America and China, astringent in its properties. The bruised leaves of *U. grandiflora* are a remedy in the United States for the bite of the rattlesnake. The root of *Helonias dioica* is used medicinally in North America. *H. frigida* of Mexico is poisonous to horses who feed on it. *Asagœa officinalis* yields the *Sabadilla* seeds, which in some countries are known as a medicine. The most remarkable and beautiful flower of this tribe is *Gloriosa superba* of the East Indies. The six petals are of a bright orange hue, curled at their edges, and bend backwards, whilst the stamens and pistil hang downwards. The leaves are wide, and terminate in a long point, rolled inwards at the end like a tendril. *G. simplex*, a species of Senegal, has a blue flower, and the leaves are merely sharp-pointed.

This Tribe is common at the Cape of Good Hope, in Asia, North America, and Europe; it exists in the Tropics of India and Australia, but is most abundant in northern countries.

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Delphinium
sp.

Deakin Limited

COMMELINACEÆ.

THE SPIDER-WORT TRIBE.

HERBACEOUS plants, the leaves of which are flat and usually sheathing at the base; the flower is composed of three sepals and three petals, which sometimes cohere at their base. The stamens are six or fewer, attached to the base of the ovary, some with irregular or imperfect anthers, the filaments beset with fine-jointed hairs. The anthers are two-celled, turning inwards. The ovary is three-celled, the style single, the stigma simple. The capsule is two or three-celled, containing two or more seeds in each cell, fixed by their side on the inner angle. The embryo lies in a cavity of the fleshy albumen, covered with a lid.

These plants are a link between the Lily tribe and Sedges and Rushes.

The roots contain a large proportion of starch.

Commelina was so named by the French botanist Plumier, in honour of two Dutch merchants and botanists, who promoted the study and culture of plants. The first species was brought from Carolina in 1732, others have been introduced since from different parts of America, as well as from Asia. It has been chosen as the type of this Order, which is interesting from being a marked transition in the scale of development in plants; uniting many characters of the sedges with the more perfect petals and structure of Alismaceæ, and also of the Lily tribe. The petals roll up and become flaccid and moist in withering, like those of the Iris. Three of the stamens are usually irregular, furnished with crossing glands of peculiar form. *Commelina caelestis* (1) is one of the most beautiful species, the ephemeral petals are of a pure blue, and the whole plant is remarkable for neatness and elegance of form. The fleshy roots contain a large proportion of starch and mucilage, which renders them fit for food. Those of *C. tuberosa*, *C. angustifolia*,

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| 1. <i>Commelina caelestis</i> , Sky-blue <i>Commelina</i> .
America. | 4. <i>Cyanotis axillaris</i> , Axil-flowered <i>Cyanotis</i> .
East Indies. |
| 1A Stamen. | 4A Stamen. |
| 2. <i>Tradescantia zebrina</i> , Zebra-leaved Spider-wort.
Mexico. | 5A. Stamen of <i>T. virginica</i> . |
| 2A Stamen. | 5B Pistil. 5C Calyx and Ovary. |
| | 5D Section of Capsule. |
| | 5E Hair, magnified. |
| 3. <i>Dichorisandra thyrsiflora</i> , Thyrsoid-flowered <i>Dichorisandra</i> .
Brazil. | 6A. Capsule of <i>Ancilema</i> . |
| | 6B Seed. 6C Section. |
| | 6D Embryo and Cover. |

COMMELINACEÆ.

and *C. striata* are likewise cooked and eaten in the countries where they are native. The Chinese use *C. medica* medicinally: *C. Rumphii* is employed as a medicine in the East Indies. Tradescantia records the name of two of the earliest travellers and patrons of botany, John Tradescant and his son; the former was gardener to Charles I., and after his travels he made the first museum of natural history in this country, which is still retained and preserved as the Ashmolean Museum in Oxford. *Tradescantia virginica*, which Tradescant brought to England, 1629, is still a favourite plant in the border, and perfectly hardy. The jointed hairs of the stamens (5) are a beautiful object for the microscope. *T. zebrina* (2) is a lowly plant, creeping over banks, spreading far by means of its rooting jointed stem: the petals, though small, have the peculiar glistening appearance of some Lilies in the sunshine. *Dichorisandra* is derived from the Greek word expressing the separation of two anthers from the rest. *D. thyrsiflora* (3) has a noble aspect when in flower, the large yellow anthers showing well in the deep blue corolla. *D. discolor* is smaller, and of less brilliant appearance. *Cyanotis axillaris* (4) is a very delicate plant, and exhibits the character of hairy stamens in a high degree; they bear on their filament white glands below the anthers, the pollen of which, and of other species of the tribe, is blue. A decoction of the plant is taken medicinally in the East Indies. *Aneilema* is a nearly similar genus, but has no involucre to the cluster of flowers; its capsule (6) contains seeds with a lid over the embryo. The species are scattered in China, Sierra Leone, and Australia. *Cartonema spicatum* belongs to the East Indies; *Murdannia scapiflora* is amongst the medicinal plants of the Hindoos; the leaves of *Flagellaria indica* are also said to have astringent properties.

This Tribe is found chiefly in the East and West Indies, Africa, and Australia. A few species exist in North America, but none have yet been discovered in Northern Asia or in Europe.

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Juncaceae
The Rush Tribe

Day & Son, Limited

J U N C A C E Æ.

THE RUSH TRIBE.



HERBACEOUS plants with fibrous or clustered roots. The leaves are hollow or flat, and channelled with parallel veins. The flowers are more or less collected in heads; they are seldom brightly coloured, usually dull brown or green. The calyx and corolla are nearly similar, glumaceous or cartilaginous, six-parted, below the ovary. The stamens are six, inserted into the base of the segments; if only three, they are placed opposite the calyx. The anthers are two-celled, turned inwards, opening lengthwise or by pores at the point. The ovary is one or three-celled, the style is single, the stigmas three, sometimes only one. The fruit is a capsule, with three valves or none, one or many-seeded. The seeds have a thin skin, a very small embryo, and contain firm, fleshy, or cartilaginous albumen.

This Tribe is closely connected with Cyperaceæ, it has also affinity with the Lily Tribe through Narthecium.

Very slight properties exist in these plants.

Juncus is a genus of very ancient utility to man, in the primæval times affording the simplest materials for covering floors, making ropes, and other homely articles. The pith of the slender stems burns readily, and in many remote parts rushes still furnish the only candles of the peasant's dwelling. Until the time of Edward IV. they were strewn on the floors of churches and all large buildings; in Westmoreland an old custom is retained of adorning the church with various emblems formed of rushes on an annual festival. *J. conglomeratus* (1) is the common species growing everywhere in watery places. *J. acutus* and *J. maritimus* assist in preventing the encroachments of the sea on the coasts of Britain and of North America, and the embankments of Holland; these, and all the large kinds which have simple channelled stems without leaves, are made into mats and various things in country places. *J. triglumis* (2) is amongst the species which have leaves; it is found chiefly on the summits of Scotch and Welsh mountains,

1. *Juncus conglomeratus*, Common Rush.

Wet places, Britain.

- | | |
|-----------------------------|-------------|
| 1A Flower. | 1B Pistil. |
| 1C Capsule. | 1D Section. |
| 1E Long Section, magnified. | |

2. *Juncus triglumis*, Three-flowered Rush.

Streams, Scotland.

3. *Luciola sylvatica*, Great Wood-rush.

England.

- | | |
|------------------------|-------------|
| 3A Flower. | 3B Capsule. |
| 3C Section of Capsule. | |
| 3D Capsule. | 3E Seed. |

4. *Narthecium ossifragum*, Bog Asphodel.

Moors, Britain.

- 4A Stamen.

and similar situations on the Continent. *J. balticus* is one of the rare plants of the Hebrides; *J. bufonius*, of our marshes, grows likewise on the banks of the Ganges. The genus has a wide range, *J. arcticus* belonging to the most northern regions, *J. antarcticus* existing in Lord Auckland's Isle in the extreme southern latitude. On the high mountains of hot regions some species find a locality as favourable as the low marshes of temperate or cold climates; the European *J. glaucus* is also a native of the Himalayas. *Luciola* was derived from the Italians, to whose vivid imagination the dewy heads of flowers seen sparkling in the moonlight gave an idea of their *lucciole* or glow-worms. It is distinguished from *Juncus* by its flat hairy leaves, and the capsule containing only three seeds. *L. sylvatica* (3) is very frequent in woods and on open ground, in May and June; though of so simple a character, it is extremely graceful in growth. *L. campestris* is a much smaller species, coming forth in grassy pastures in early spring. Several kinds abound in Switzerland. *Narthecium* has a more highly-developed flower than other genera of this tribe, and forms a link with some of the lowliest examples of the lily tribe. *N. ossifragum* (4) is the brightest ornament of the wild moors in the Scotch Highlands, growing on the dark peat earth amidst small species of *carex*, grasses, and mosses. The stiff sword-shaped leaves, and the spike of delicate flowers, are sure to attract the notice of a traveller of botanical inclination. The corolla remains, and becomes thickened as the capsule enlarges. The seeds are numerous, enveloped in a long membranous skin. *Calectasia* is one of those plants of which the anthers open by pores at the end; the flowers are dry, of a star shape, and brilliant violet colour. In Australia grows also *Xerotes*, in the structure of the flowers showing affinity to Palms. On the sand-hills near the coast of Tasmania, *Astelia alpina* affords a link with sedges, the inner part of the base of the wide leaves yields some wholesome food. At the Cape of Good Hope *Prionum palmita* rises with a thick black spongy stem, surmounted with a crown of leaves. One species of *Juncus* is cultivated in Japan, entirely for making mats for floors.

This Tribe inhabits chiefly the colder countries of the world, extends as far North as Melville Isle, where it forms about $\frac{1}{25}$ of the flowering plants; in the Temperate regions about $\frac{1}{90}$; in the Tropics $\frac{1}{400}$.

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P A L M A C E Æ.

THE PALM TRIBE.

TREES with a simple stem, occasionally branching shrubs, rough with the bases of the leaf-stalks or their scars. Calamus has a long slender stem, sometimes armed with spines. The leaves are in clusters, terminal, usually very large, pinnate, plaited, fan-shaped, with parallel simple veins; sometimes wedge-shaped. The flowers are on a terminal scaly spadix, enclosed in a single or many-valved spathe, which is often woody. The flowers are small, having scaly bracts; the stamens and pistil are usually separate. The sepals are three, fleshy or leathery, persistent; the petals are three, the stamens inserted into the base of the corolla, usually six, seldom three. The ovary is free, usually composed of three carpels completely or partially united; the styles three. The fruit is a drupe, nut, or berry, often having a fibrous rind. The seed fills the cavity in which it grows, and contains cartilaginous albumen, in which is the embryo, its place indicated by a small swelling on the back of the seed (2A).

This Tribe has slight affinity with Pandanaceæ.

Oil, wax, farina, sugar, and salt exist in these trees.

Palms have received the highest admiration in all ages: inspired writers have taken a Palm as an emblem of prosperity, and a symbol of victory. Botanists have bestowed on them the noblest titles, and they are unrivalled in the vegetable world, in simple grandeur of form, and for their varied and extensive utility to man, especially in the countries where they flourish. The first mention of them in Scripture, is when Moses, having led the Israelites through the Red Sea, they encamped under the shade of seventy Palm-trees. From the earliest times Palms have, without cultivation, furnished everything necessary to the existence of the natives: excellent materials for dwellings, cordage of all kinds, clothing, food, and many other valuable substances. The strong fibres which bind the base of the leaf-stalk to the stem are available in various ways; few European ships leave the Brazilian coast without a store of Palm fibres. Some, which are tough, bristle-like, are made into strong brooms, now almost superseding those made of Birch twigs.

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|--|--|------------------------------------|
| 1. <i>Chamærops humilis</i> , <i>Dwarf Palm</i> . | 4. <i>Sagus Rumphii</i> , <i>Sago Palm</i> . | E. Indies. |
| South Europe. | 4A <i>Flower, opened</i> . | |
| 1A <i>Stamen Flower</i> . | 5. <i>Cocos nucifera</i> , <i>Cocoa-nut Palm</i> . | I. Isles. |
| 1B <i>Stamens</i> . | 6. <i>Phytelephas macrocarpa</i> . | <i>Ivory-nut Palm</i> . |
| 1C <i>Fertile Flower</i> . | | Peru. |
| 1D <i>Ovaries</i> . | 7. <i>Fruit of Elais</i> . | |
| 1E <i>Fruit</i> . | 7A <i>Seed</i> . | 7B <i>Fruit without the bulb</i> . |
| 2. <i>Phoenix dactylifera</i> , <i>Date Palm</i> . | SA <i>Section of Palm fruit</i> . | |
| Levant. | | |
| 2A <i>Seed</i> . | | |
| 2B <i>Sprouting</i> . | | |
| 3. <i>Calamus palustris</i> , <i>Rattan Palm</i> . | | E. Indies. |

PALMACEÆ.

The fibrous exterior of the Cocoa-nut Palm is woven into the elastic Coir rope, one of the best materials for cordage and mats. *Chamærops* (1) is the only Palm advancing into Europe, growing on the south coast, in N. lat. 44°. In Morocco it covers the hills like brushwood; in England it requires the shelter of a conservatory, where it bears countless flowers, but not fruit. *C. Palmetto* extends to the most northern limit of the race in N. America, to 36° N. lat. *Phoenix dactylifera* (2) is a wonderful example of fertility, affording the chief supply of food to the people of Northern Africa and Arabia. A single spathe contains 12,000 stamen flowers, and the cluster of fertile flowers produces a prodigious quantity of fruit. The sap of the stem is obtained by cutting off the crown, as in other Palms, and is highly esteemed as a beverage. The spathe of *Alfonsia* has been reckoned to contain 200,000 flowers; and each cluster of a Palm of the Orinoco bears 8000 fruit. Calamus, the Rattan, is of peculiar growth, partly resembling the Bamboo; the leaves secreting silex also connects this Tribe with Grasses. Instead of a columnar stem, it has a long, round, jointed stem, in some instances 500 feet in length, stretching like cables over trees, rendering the jungles almost impenetrable. The leaves are pinnated, of most graceful form, the leaf-stalk often prolonged to one or two feet, as in *C. palustris* (3). This genus ascends to 6000 feet on the outer range of the Himalaya. *Plectocomia* likewise climbs over tall trees. A large supply of Sago is obtained from the pith of *Sagus Rumphii* (4), the fruit of which is sometimes brought to this country, although useless. *S. laevis* and *S. genuina* grow in dense forests in the Moluccas, yielding an abundant pith for Sago. One of the most valuable and beautiful of Palms is *Cocos nucifera* (5), fringing the coasts of the isles of the Chinese Sea, Indian Ocean, and Pacific. In Ceylon, groves of Cocoa-nut Palms border the shore for thirty miles; they live a century, bearing each month as many as fourteen nuts, and yielding as much oil as an Olive-tree. The fibres make excellent cordage, and serve countless useful purposes to the natives and Europeans. The fruit of *Phytelephas* (6) is of a fine white texture, and is worked like ivory. Since the formation of railroads, the necessary use of grease for wheels has been extreme; but the stores of vegetation are unlimited, and the power of commerce, in transporting abundance wherever needed, is unbounded. On the coast of Guinea are groves of *Elais Guineensis* (7), yielding plentifully an oily substance of a bright yellow colour, admirably adapted for carriage-wheels, and also for soap and candle manufacture. Besides this value, a still higher interest belongs to it, as the British ships frequenting the coast to bring it away have been a means of greatly diminishing the traffic in slaves, who were collected and kept in huts on the shore. *Corypha*, the noble Fan Palm, belongs to the East Indian Islands; the gigantic leaves are six feet long and fifteen wide, divided into 100 segments at the edges, of much value in thatching, and for umbrella-like hats. The stems of some are marked with a black spiral line, indicating the position of former leaves. The fruit of *Areca Catechu* is the Betel, indispensable to nearly all Asiatics. *Hyphæne Thebaica*, the celebrated Doom Palm of Egypt, has a branching, forked stem. *Ceroxylon andicola* is found on the Andes, at 9000 feet, in the region of Quito; a resinous wax exuding from its stem of 180 feet, is used for candles by the miners. *Mauritia*, *Iriarteia*, and other Palms, abound on the lower elevations of the Andes. In a former period of the world, Palms appear to have existed abundantly at the mouth of the Thames.

This extensive Tribe is dispersed most abundantly in the Tropics of Asia and America, on the humid banks of rivers, on the shores of the ocean, on lofty mountains, and on plains. The limits of its range are at 36° N. lat. in N. America and at 38° S. lat. in New Zealand.

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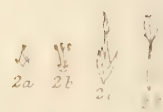


PANDANACEÆ.

of the species. The young leaf-buds are by some Asiatics eaten and esteemed, like those of *Palms*; and the fruit, although not of a pleasant flavour, forms part of their food in times of scarcity; the seeds are also considered eatable. The flowers of *P. odoratissimus* are highly fragrant, yielding one of the richest of Eastern perfumes: for the sake of this scent the trees are much cultivated in Java. The women of the islands of the South Pacific Ocean strew the pollen of the anthers over their hair. *P. candelabrum*, the chandelier-tree of Guinea and St. Thomas's, has forked branches, with spiral traces of former leaves, presenting a very remarkable appearance. *P. utilis*, of the Isle of Bourbon, is of less size; the smallest species is the dwarf Screw-pine of the Mauritius, *P. humilis*. The sharp spines of the edges of the leaves, and along the under side of the mid-rib, render it suitable to protect fields, for which purpose it is very frequently planted in India. Although Screw-pines flourish most on the shores or flat districts of islands, they will thrive likewise on mountains; some have been found at 4000 feet elevation on the Himalaya. Freycinetia *Baueri* is the Grass-tree of Norfolk Isle, one of the most striking examples of its luxuriant vegetation; scrambling prostrate on the ground, or climbing round the trunks of trees. The branches are crowned with the drooping crests of long, slender, graceful leaves, from the centre of which come forth clusters of flowers, producing fruit four inches long, filled with a red pulp within the drupes which form the exterior. The fruit of *T. imbricata* (2) is nearly similar. Some species of Freycinetia are of considerable size; all belong to the isles of the Indian Archipelago. The leaves of *Cyclanthus*, *Carludovica*, and *Nipa*, are fan-shaped or pinnate, and the flowers have a calyx. The juice of *Nipa* is obtained by bruising the spadix of the flowers, and when fermented is considered a pleasant kind of Palm-wine in Java. The seeds of Freycinetia and Pandanus contain crystals, conspicuous without the aid of a microscope. A fossilized fruit of Pandanus has been found in the Oolite of Charmouth in Devonshire.

This Tribe inhabits the islands of the Indian Ocean, and most of the Tropical isles of the Eastern hemisphere. *Cyclanthus* belongs exclusively to South America.

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TYPHACEÆ.

THE BULRUSH TRIBE.

HERBACEOUS plants growing in marshes or ditches. The stems are without joints. The leaves are rigid, sword-shaped, with parallel veins. The flowers are closely set on a spadix without a spathe. The stamens and pistils are in separate flowers; the corolla consists of three scales, or more, or a bundle of hairs. The stamens are three or six; the anthers wedge-shaped, attached by their base to long filaments, united together in some instances. The ovary is simple, above the scales, one-celled; the style is short, the stigmas simple and linear. The fruit is dry, not opening when ripe, one-celled, one-seeded, angular by pressure. The seed contains mealy albumen.

This Tribe has affinity with Cyperaceæ and with Araceæ, but is distinguished by the triple parts of the corolla, and the wedge-shaped anthers.

Very slight properties exist in these plants.

Typha, which gives its name to this Tribe, was named from the Greek for marsh, where the species generally grow. *T. latifolia* (1) is one of the finest of our aquatic plants, of very picturesque appearance when the dark-brown spike of inflorescence rises amongst the tall leaves. Its old name of *mace-reed* seems to indicate that it was supposed to be like that token of power and dignity, and for that reason, probably, it was very frequently adopted by the ancient Italian painters as a sceptre in the hand of Christ, when the soldiers in mockery saluted him as king. It grows in watery places in all Temperate countries, so was doubtless at all times a well-known popular plant. The pollen of the anthers is of a very inflammable nature, readily burning with a bright light. In poor countries, the downy seeds are sometimes used to stuff pillows, the stalks and leaves are made into mats, and are also useful for thatching. The young roots, which contain starch, are said to be eaten by peasants in Germany; in some countries of Asia, the natives consider them to have medicinal properties. In general value, however, these plants are not of any important use to man, nor is their foliage good fodder for cattle. *T. latifolia* covers lagoons in Jamaica, often mingled with another English aquatic *Potamogeton natans*. Two smaller species are rarely found in England; and a third, *T. minima*, with slender, bristle-like leaves, grows

1. *Typha latifolia*, Great Bulrush, or Cat's-tail.
Marshes and streams, England.

1A Pistil Floret.
1B Magnified.

2. *Sparganium simplex*, Upright Bur-reed.

2A Pistil Floret. Streams, England.
2B Stamen Floret. 2c Pistil Floret magnified.
2D Stamen magnified.

TYPHACEÆ.

in the wet sands of Alsace. The British *T. angustifolia* is also a native of the southern, as well as the northern parts of India, in Siberia, in the Caucasus, and in Australia; affording an example of the capacity aquatic plants possess of adapting themselves to various countries and climates. One species of *Typha* nearly resembling it is very frequent in pools in St. Domingo. *T. elephantina* is common in India, and much employed by the natives in making mats and other useful articles. *Sparganium* is a name said to be derived from the Greek for band, alluding to the ribbon-like leaves; it is very common in streams and ditches throughout Europe, usually intermixed with *Sagittaria* and *Lythrum*. It is dispersed, likewise, throughout North America, has been found in Australia, and one species (*S. carinatum*) was discovered by Dr. Falconer in Cashmere. *S. simplex* (2) is frequently found in watery places on a gravel soil; the erect stem is entirely simple, except that the lowest head of flowers is placed on a short stalk. *S. ramosum*, a larger species, has strong creeping roots, which soon fill up a pond if not cleared away. *S. natans* formerly floated abundantly in the fens of Cambridgeshire and Lincolnshire, but is now chiefly to be seen in Scotch lakes.

This small Tribe inhabits the marshes, streams, and ditches in the northern countries of the world; it is rare in the Tropics, two species only are known in Equinoctial America, one in the West Indies, one in Australia.

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A R A C E Æ.

THE ARUM TRIBE.

SHRUBS and herbaceous plants without a stem, some of which have a fleshy root, others are climbing, and have aerial roots, and some are aquatic, floating on water. The leaves are sheathing at the base. The flowers are placed on a spadix and enclosed in a spathe, or are simple and in a spathe, sometimes proceeding from the margin of the frond. The calyx and corolla are wanting, or consist merely of a few scales. The stamens and pistil are usually in different flowers, united in Calla, of definite or indefinite number, the filaments often united. The ovary is free, usually one-celled, with a short style and simple stigma. The fruit is a succulent berry with pulpy seeds which usually contain albumen.

This Tribe has affinity with Typhaceæ; Lemna connects it with less developed Orders of plants.

Acrid juices exist in these plants, but the roots contain wholesome starch.

Arum is supposed to be derived from the ancient Egyptian name; it is a remarkable genus, taken as the type of this Order, widely dispersed in the hot regions of the world, and extending in the form of one species to Britain. In some countries it finds a suitable temperature on mountains, requiring only a short season for its development. On the Himalaya several species abound of immense size, with green or purple spathes, ending in the slender tail eighteen inches long. *Arum maculatum* (1) is common on hedgebanks throughout England, where it is amongst the first to unfold its glossy leaves in spring. The roots or corns contain a slightly acrid juice, which is immediately dissipated by drying or preparing by fire, and the remaining starch is wholesome as food. In the Isle of Portland, where the plants are abundant, and food sometimes scarce, the inhabitants collect the roots and prepare a powder from them, known and sold as Portland Sago. *A. tortuosum* (7) is

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| 1. <i>Arum maculatum</i> , Cuckoo-pint.
Hedges, England. | 4. <i>Lema gibba</i> , Common Duck-weed.
Fresh water, Britain. |
| 1A Spadix. | 4A Flower magnified. 4B Stamen. |
| 1B Fruit open. | 5. <i>Pistia stratiotes</i> . Tropics. |
| 1C Seed. | 5A Flower. |
| | 5B Section of Ovary. 5C Seed. |
| 2. <i>Richardia ethiopica</i> . White Arum.
Cape of Good Hope. | 6. <i>Acorus calamus</i> . Thames, England. |
| 3. <i>Amorphallus bulbifer</i> , Bulb-bearing Amorphallus.
East Indies. | 7. Spadix of <i>A. tortuosum</i> . India. |
| | 8A Flower of <i>Calla palustris</i> |
| | 8B Section of Fruit. |

ARACEÆ.

one of the Indian species, growing in damp places: the leaves are four feet wide, composed of nineteen leaflets; the spadix is upwards of a foot in length, wavy, and extending beyond the spathe: the roots are eatable. *A. Dracunculus*, the Dragon Arum, has spotted leaves, and strong-scented spathe; like others, it possesses medicinal properties, and was probably used formerly, as *A. maculatum* is said to have been in the time of Theophrastus. *Richardia* (2) is the fairest specimen of this Tribe, producing its ivory-like spathes in full beauty in our conservatories, and affording an interesting example of the more perfect development of the Tribe in the Tropics. Comparing this graceful polished plant of Ethiopia with the dwarf hairy rough *Calla palustris* of the marshes of Northern Europe, the contrast is striking. Our British Arum forms an intermediate link in the chain. *Amorphallus* (3) is a genus of Bengal, where several species are known to the natives as affording eatable roots. *Caladium* differs from Arum in bearing stamens at the top of the spadix, glands in the middle, and germens at the base. *C. odorum* has berries the size of a cherry. *Colocasia* was cultivated for food by the ancient Egyptians. *C. himalensis* forms the chief support of the hill-people in some districts of the Himalaya. The roots of *C. macrorhiza* and *C. esculentum* afford the favourite yams of the South-sea islanders. Various species yield medicine, or juices used for blisters in their native countries. *Scindaspus officinalis* is one of the medicinal plants of the Hindoos. *Dracontium*, *Arisæma*, and *Monstera*, are among the useful medicines of Brazil. The most powerful plant of the Tribe is *Dieffenbachia seguina* of the West Indies and South America. It grows to the height of five or six feet, and is called Dumb Cane, from its effect on the tongue of those who incautiously bite the leaves. *Pythonium* is found as far north as Nagkanda, on the Himalaya, at an elevation of nine thousand feet. *Pothos*, so called from its name in Ceylon, is a parasitic genus, growing and climbing on old trees by means of aerial roots, both in the East and West Indies. *P. palmata* has leaves three feet long, on a stalk of equal or greater length. *P. pedatus* and *P. quinquenervis* exist on the Andes at eight thousand feet above the sea. *Acorus* (6) was known to the ancients, and is a native of Asia as well as of Europe. *Lemna* (4) is the most simple of all flowering plants, the stem and leaf being combined into a small frond; the flowers have neither calyx nor petals, and are encased in a membranous bag lying in the frond. *Pistia* (5) is more complete, having the two flowers in a spathe; it floats on fresh water like *Lemna*: the roots have little hooded vesicles at their points. On the Nile at Sennaar, in pools during the rainy season in India, and in water-tanks in Jamaica, this singular plant is to be seen.

This Tribe abounds in the Tropics, but is rare in Temperate regions, where the species are usually herbaceous; in Tropical countries many are trees, others climbing parasites, with aerial roots. *Lemna* belongs to Europe and cool parts of Asia.

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The 'edge-Tribe'

CYPERACEÆ.

THE SEDGE TRIBE.

HERBACEOUS, grass-like plants, the stems of which are hollow, and seldom have partitions at the joints; frequently tubular, sometimes tuberous at the base. The leaves are narrow, and usually enclose the stem with a sheath which is never slit. The flowers consist of imbricated solitary bracts, without calyx or corolla. The stamens and pistil are often in separate flowers; the stamens are from one to twelve; the anthers fixed by their base, entire and two-celled. The ovary is one-seeded, often surrounded by bristly hairs at the base; the style is single, bifid, or trifid; the stigmas are undivided, occasionally bifid. The fruit is a hard nut, with a single seed, containing fleshy or mealy albumen.

This Tribe has close affinity with grasses.

A wholesome mucilage is contained in the tubers of some of these plants.

Cyperus is a genus inhabiting marshy, watery places, of few useful properties, though in former times of scarcity the roots of *C. longus*, the largest English species, and those of *C. esculentus* in France, were boiled and eaten by peasants. The latter is still known as *Souchet comestible*, and the roots form one of the ingredients of orgeat. *C. fuscus* (1) is a rare species in this country, more frequent on the Continent. *C. longus*, the Galingale, is seldom seen here now, only occasionally in Wales; the root is creeping, and has an aromatic flavour; the stem is two or three feet high, bearing a spreading panicle of shining spikes. *C. bulbosus*, of Malabar, has small tubers, which the natives cook and eat. *C. Iria* is known as a medicine in India; the roots of *C. rotundus* are also employed by Hindoo doctors. Indian ladies use the powdered roots of *C. pertenuis* to perfume their hair. The properties of these plants are of slight value, yet they appear among the most ancient remedies mentioned by Hippocrates and Theophrastus. The numerous species of Carex, like those of Cyperus, are usually found growing in wet places and

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|---|---|
| 1. <i>Cyperus fuscus</i> , <i>Brown Cyperus</i> . England. | 5. <i>Scirpus tuberosus</i> . China. |
| 1A <i>Outer Glumes</i> . 1B <i>Inner</i> . | 5A <i>Glume</i> . 5B <i>Flower</i> . |
| 1C <i>Stamens and Pistil</i> . | |
| 2. <i>Carex arenaria</i> , <i>Sand Sedge</i> . | 6. <i>Scirpus maritimus</i> , <i>Saltmarsh Clubrush</i> . |
| 2A <i>Glumes</i> . Shores, Britain. | England. |
| 3. <i>Carex stricta</i> , <i>Straight Sedge</i> . | 7. <i>Isolepis acicularis</i> , <i>Least Spike-rush</i> . |
| Marshes, Britain. | Bogs, England. |
| 4. <i>Eriophorum polystachion</i> , <i>Broad-leaved Cotton-grass</i> . Bogs, Britain. | 8A. <i>Carex rivularis</i> . |
| 4A <i>Seed and Down</i> . | 9A. <i>Scirpus lacustris</i> . |
| | <i>Flower with Bristles</i> . |
| | 9B <i>Seed</i> . |

CYPERACEÆ.

bogs; a few inhabit shady moist woods, mingling their gracefully drooping spikes amongst the grasses and other plants. The larger species are more useful in other countries than here; the Laplanders prepare some to stuff garments for warmth, and in Italy they serve various purposes. The long penetrating roots of *C. arcnaria* (2) bind the loose sand of the shores of the Solway Frith, and on the dykes of Holland this and other species are carefully cultivated for the sake of fixing the light soil, and giving strength to the embankments. *C. stricta* (3) is more upright than other nearly similar species; *C. riparia* has the widest leaves, still used for chairs in Italy, as once here. *Eriophorum* is peculiar to moors and bogs in northern countries; *E. polystachion* (4) has a remarkable appearance, when the white silky tufts are seen waving over the moors of the Scotch Highlands, or the bogs of North Wales; in those barren and poor districts the down is sometimes collected for stuffing pillows. The leaves of *E. cannabinum*, of the Himalayas, are made into ropes by the natives. *Scirpus* derived its name from the Celts, who doubtless availed themselves of its valuable qualities in their domestic life. *S. lacustris*, the bulrush, was thought good formerly for thatching cottages, stuffing pack-saddles, and forming the seats of chairs. *S. cæspitosus* is still the chief food of cattle in the Highlands during the spring months. *S. maritimus* (6) is eaten readily by cattle in the marshes of Europe and Siberia. The Chinese esteem the tubers of *S. tuberosus* (5), and cultivate it in tanks in their gardens. *Isoplepis* (7) is chiefly distinguished from *Eleocharis* by having no bristles under the ovary, and the style not being jointed at the base. It grows always in turfy bogs. The most celebrated plant of this tribe is *Papyrus antiquorum* of Egypt; out of a long horizontal root rises the triangular stem, from the inner layer of which the ancient Egyptians made their paper. The spreading umbel of flowers adorned their temples, and the stalks and leaves were formed into ropes and boats in the time of Pliny, as is still done in Abyssinia. *Mariscus* and *Kyllingia* both belong to the East Indies and Brazil; *Fuirena* to Australia and South America.

This Tribe inhabits marshes, ditches, streams, woods, dry sands, and lofty mountains in all parts of the world where vegetation exists. In Lapland it is as abundant as grasses, in the Tropics more rare. *Scirpus* belongs to Europe, South America, and Australia.

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GRAMINACEÆ.

THE GRASS TRIBE.

HERBACEOUS plants, the stems of which are sometimes large, and endure for many years. The root is a rhizome, either bulbous or fibrous. The stems are cylindrical, usually hollow, and closed at the joints, containing a considerable portion of silex, sometimes solid. The leaves are narrow, undivided, alternate, with a split sheath and a membranous edge at the junction with the stem. The flowers are green, in small spikes, arranged on branching stalks, panicles, or spikes; the stamens and pistil are sometimes separate, the corolla is composed of imbricated bracts, the two outer glumes enclosing the inner glumes and the stamens; at the base of the ovary are two smaller scales. The stamens are generally three, occasionally six. The ovary is simple, with two or three styles, the stigmas feathery or hairy. The seed contains farinaceous albumen.

This Tribe has close affinity with Sedges, but is distinguished by the round and hollow stems, and the numerous bracts of the flower.

An abundant wholesome starch is contained in the seeds of many of these plants, an aromatic secretion exists in the leaves of others, and silex in the stems.

Since the Creating Word went forth, "Let the earth bring forth grass," this tribe has been the most important throughout the whole range of vegetation. Nearly all the species are small in size, but having spreading roots extend over vast tracts of land in all temperate regions, affording large supplies of food to man and cattle. In the Tropics the species are of loftier growth, and for the most part stand singly. The tall, rapid growing Bamboo forms a kind of link with Calamus amongst Palms. Of all cultivated plants corn ranks highest, in the quality of the nutriment of its seeds, farinaceous matter and gluten being combined. It is not the most prolific, Wheat bearing generally 100-fold on one stalk; Rice 120-fold, and Maize as much as 800-fold in hot damp climates, though in the soil and temperature of California not more than 70-fold. The several species of *Triticum* (1) known as wheat, yield the best flour for bread, most esteemed in all ages, in all civilised countries. *T. compositum* is the ancient wheat of Egypt, and of excellent quality. The gluten is the chief ingredient causing the fermentation of bread, and has also the most nourishing property; this is more fully developed in the south of Europe

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| 1. <i>Triticum æstivum</i> , <i>Wheat</i> . | The East. | 7. <i>Phleum pratense</i> , <i>Cat's-tail Grass</i> . England. |
| 1A <i>Cluster of Flowers</i> . | 1B <i>Glumes</i> . | 7A <i>Floret</i> . |
| | 1C <i>Seed</i> . | 7B <i>Inner Glume</i> . |
| 2. <i>Hordeum distichon</i> , <i>Barley</i> . | Tartary. | 7C <i>Ovary and Pistils</i> . |
| 3. <i>Zea Mays</i> , <i>Maize</i> , or <i>Indian Corn</i> . | | 8. <i>Briza media</i> , <i>Quaking Grass</i> . South Europe. |
| 3A <i>Seed</i> . | America. | 9A. <i>Seed of Rice</i> . |
| 4. <i>Saccharum officinarum</i> , <i>Sugar-Cane</i> . | East Indies. | 9B <i>Inner Side</i> . |
| | | 9C <i>Section magnified</i> . |
| 5. <i>Panicum italicum</i> , <i>Italian Millet</i> . | Italy. | 10A. <i>Flower of Agrostis alba</i> . |
| 6. <i>Phalaris canariensis</i> . | | 10B <i>Flower without Glumes</i> . |
| 6A <i>Seed with Glumes</i> . | 6B <i>Seed with Scales</i> . | 11A. <i>Seed of Coix lacryma</i> . |

GRAMINACEÆ.

than in the north, therefore the Macaroni and other preparations of wheat flour in Naples are superior to any manufactured in this country. Starch is obtained from wheat by steeping it in water and beating it in bags. The straw is of various uses; that grown on chalk soil is best for plaiting. The finest plait is made of straw pulled whilst green, and bleached during summer in the dry beds of rivers in Tuscany. *Hordeum* is a genus containing several species; *H. pratense* and *H. murinum* of Britain of no value as food; *H. distichon* (2) and others are the useful barley, a hardier plant than wheat, growing further north and ripening its grain under a less glowing sun. *Avena*, Oats, is hardy, and suited to a damp cold climate, it furnishes the oatmeal for the daily fare of all northern people, and the best food for horses. *Secale*, Rye, thrives further north than any other corn; in the north of Germany the black Rye-bread baked twenty-four hours is considered very nourishing; a coarser kind feeds horses. *Zea* (3) the abundant source of nutriment to the populous tribes of Indians both in North and South America, is the most luxuriant crop in appearance; the wide leaves, the drooping panicle of stamen flowers on the summit of the stalk, the clusters of shining grain enveloped in the sheath below, render it an exceedingly beautiful plant. The general range of its culture is between 40° N. and S. on level plains, but on the elevated tablelands of Mexico it flourishes at 8680 feet, and on the Andes at 12,800 feet. It was introduced to the East Indies, China and Japan, but is not so general as rice. In N. America Indian corn is prepared in various ways for food. *Z. curagua* is the Valparaiso Cross-corn, the seed when roasted splitting into a cross. *Saccharum* (4), now the most essential luxury of man, one of the first objects of culture and commerce, was rare and only used medicinally in the time of Pliny. Growing wild in the East and West Indies, China, Africa, S. America, and the Isles of the Pacific, it was first cultivated in the East; now sugar plantations exist in all favourable localities within a zone reaching to about 40° on either side the Equator. It is remarkable that one of the greatest comforts of man should have been for two centuries the cause of the greatest misery; when it shall be cultivated only by free hands the enjoyment of it may be unalloyed. The jointed stem is as much as 12 feet high, yielding a plentiful supply of sweet juice when cut and crushed. An immense portion of food is afforded by *Oryza*, Rice; the chief requisite for its growth is irrigation, and that in a warm temperature; this can be readily found in most parts of India, the south of China, and Japan. The extensive rice-fields in Carolina sprung from a small quantity given by the Treasurer of the East India Company to a Carolina trader; transplantation had a good effect, and Carolina Rice is reputed the best. *Panicum italicum* (5), a kind of millet, yields eatable seeds. The Indian Millet, *Sorghum vulgare*, is grown in Arabia and throughout Southern Europe, much used in soups; in the West Indies it is the daily food of Negroes. *Phalaris* (6) is cultivated in the Isle of Thanet, for singing-birds. *Phleum* (7) is one of the common grasses in pastures. *Arundo*, the largest British grass or reed, grows in deep ditches near the Thames. Many European grasses are found on lofty mountains in hot countries; *Dactylis* at 14,000 feet on the Andes; *Poa* and *Festuca* on the Himalaya. The most beautiful of all grasses are *Gynerium argenteum* and *G. saccharoides*, bearing silvery panicles above long leaves. The tall stems are used in St. Domingo and in Cumana, for arrows and other purposes. The glumes of *Coix* (11) harden and enclose the seed, which hangs on slender stalks, and is called Job's tear.

This tribe exists almost everywhere, from the Equator to Spitzbergen, and to Lord Auckland's Isle. On mountains it ascends nearly to the limit of perpetual snow.

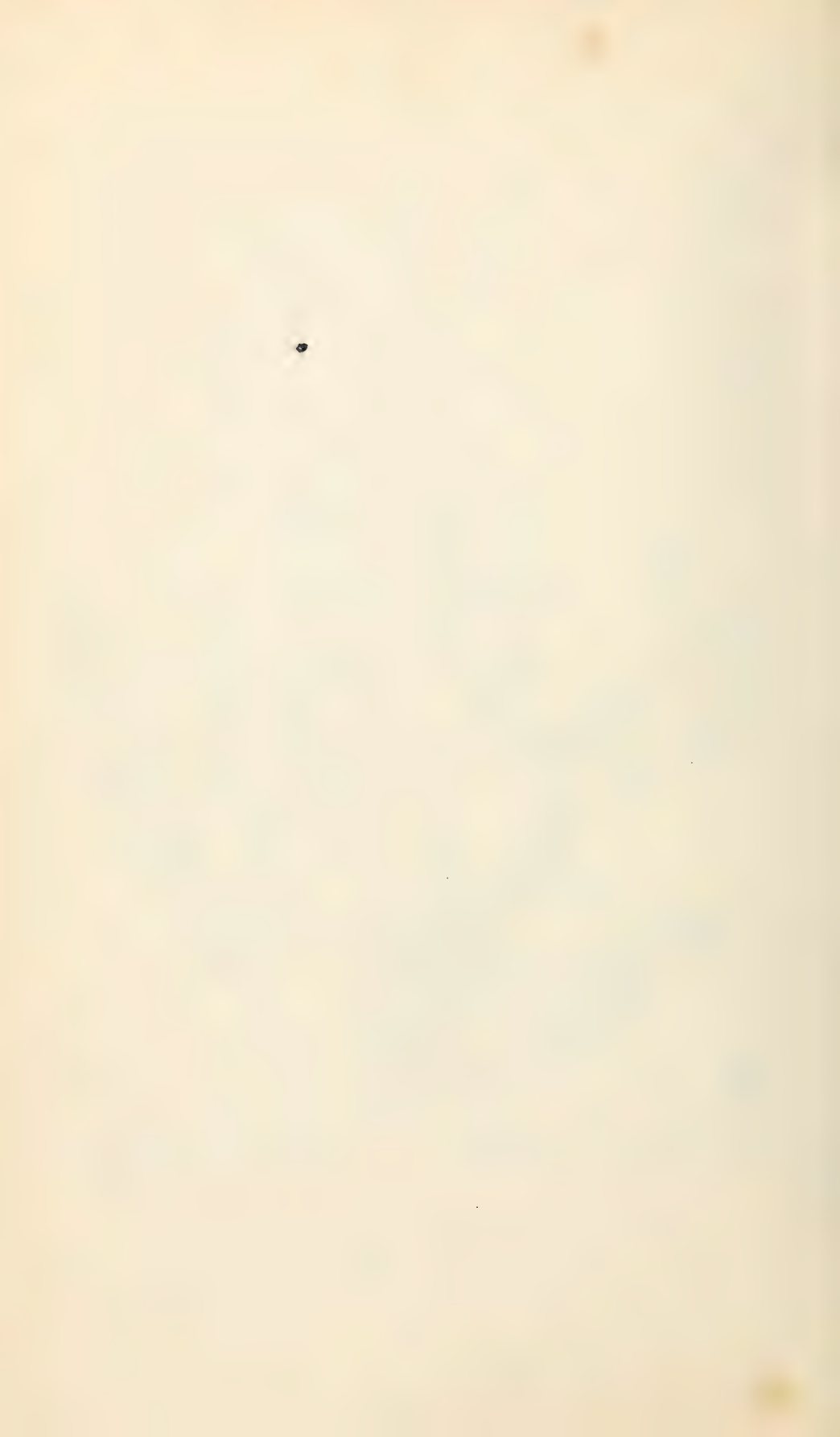
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Menyanthes
 Buttercup-wood Tribe

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N A I A D A C E Æ.

THE WATER-WEED TRIBE.

WATER-PLANTS inhabiting both fresh and salt water. The leaves are very cellular, with parallel veins, and usually membranous stipules between the leaf-stalks, sometimes sheathing at the base. The flowers are inconspicuous, often arranged in terminal spikes, or within herbaceous spathes: the stamens and pistil are sometimes separate; the corolla is composed of sepals and petals nearly alike, or of scales often falling away; the stamens are of definite number, attached to the base of the ovary, which is single or many, above the calyx; the stigma simple. The fruit is dry, very rarely opening by regular valves, or drupaceous, one-celled, and one-seeded. The seed contains no albumen.

This Tribe has only slight affinity with Juncaceæ.

Scarcely any useful properties exist in these plants.

Naias, meaning a water-nymph, is selected as the head of a small tribe composed of various aquatic plants of scarcely any beauty of form or colour, and very few useful qualities to man. *Naias marina* (1) was found and described by Pietro Michelio, a botanist of Florence, in 1729; it grows plentifully in the canal between Pisa and Leghorn, and is of a thin pellucid substance, like most of these aquatics. *Zannichellia* (2) was so named in memory of a Venetian of the last century. It abounds in marshes in some parts of England, and in many countries of Europe. The single stamen of the flower stands upon a separate stalk by the side of the four or five pistils; the seeds are toothed along the outer edge, and contain each a single seed. *Zannichellia* and *Naias* are both translucent cellular plants, without either an outer skin or pores, for which reason they rapidly perish when taken out of the water. *Caullinia* is of a similar nature, and exhibits in its transparent stem the circulation of the sap between the joints. *Triglochin* is derived from the Greek, alluding to the three angles of the capsule. *T. palustre* (3) is common in marshes, and is readily distinguished from other plants when in fruit, by the singular form

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| 1. <i>Naias marina</i> , <i>Water-weed</i> . South Europe. | 4. <i>Potamogeton perfoliatum</i> , <i>Perfoliate Pond-weed</i> . Ponds, England. |
| 1A Ovary. 1B Section. | 4A Flower, magnified. |
| 2. <i>Zannichellia palustris</i> , <i>Horned Pond-weed</i> . Ponds, England. | 4B Petal and Stamen. |
| 2A Flower. 2B Ovary. | 4C Ovaries. 4D Seed. |
| 3. <i>Triglochin palustre</i> , <i>Marsh Arrow-grass</i> . Marshes, England. | 5. <i>Zostera marina</i> , <i>Sea Wrack-grass</i> . Shores, England. |
| 3A Flower. | 5A Section of Sheath. 5B Ovary. |
| 3B Petal and Stamen. | 5C Seed. 5D Anther and Pollen. |
| 3C Section of Ovary. | 6. <i>Ouviranda fenestralis</i> . Madagascar. |

of the seed-vessel. In the Highlands of Scotland it is abundant, and is said to afford agreeable food to cattle; probably on account of a salt flavour which prevails in this as well as in the other British species, *T. maritima*. This latter plant is limited to marshy places on the coast, chiefly to the south of our island; the capsules have six angles, and do not acquire the arrow-head shape in ripening. *T. bulbosum* represents the genus at the Cape of Good Hope. *Potamogeton* (4), from the Greek for near a river, betokens the locality of nearly all the species. Some are of the pellucid nature frequent in aquatic plants, brittle when dry, in the air, entirely without hairs or down on the surface. They afford shelter to various small creatures inhabiting water, and food to many. *P. perfoliatum* (4) is common in streams and ditches in most of our counties. *P. natans*, with wide oval leaves, of a tough leathery substance, is a favourite food of the swan: the root is eaten by poor peasants in Siberia. *P. crispum* is eagerly devoured by ducks. In the Swiss lakes, *Potamogeton* abounds, *P. serratum* and others forming dense masses in the limpid waters. *Zostera* (5) was named from the Greek for riband. It is remarkable that, in the early history of botany, plants were most frequently named from some characteristic in their general appearance; in after times, more generally in memory of some naturalist; in the present day they usually receive the name of the discoverer. *Zostera* approaches towards the true sea-weeds in form, and mingles with them on the shore when uprooted; but it is still in the class of flowering plants, and has a single stamen and two pistils placed alternately on a long membranous sheath, filled with air. The pollen of the anthers is in long fine threads. On the eastern shores, the Sea-wrack is useful in preventing the encroachments of the sea on the sand; as thatch, it is said to be exceedingly durable, becoming bleached by exposure to the air. Horses will eat it, but cows refuse it. Italian flasks are usually wrapped in it, and in poor districts on the coast it is used for stuffing cushions and packing. *Amphibolis zosteraefolia* is brought by the ocean waves to the shores of New Holland, and another species is seen in the West Indies. *Ouviranda fenestralis* (6) is a singular exception to the general composition of a leaf, being destitute of pulpy matter, the netted veins forming the whole substance. It was discovered growing in the water in the Bay of Diego Soave, in Madagascar, and sent thence to the Jardin des Plantes in Paris; the roots are wholesome.

This Tribe inhabits marshes and watery places from the North Sea to the Mediterranean. It is found also in the Indian Ocean, on the coasts of Arabia, at the Cape of Good Hope, in Tropical America, and in Australia.

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Equisetum
Horse-tail Tribe

EQUISETACEÆ.

THE HORSE-TAIL TRIBE.

LEAFLESS branched herbaceous plants, with a hollow, striped, jointed stem, containing silex; the joints separable, and surrounded by a membranous sheath. The stem is composed chiefly of cellular tissue, but is strengthened externally with a layer of hard woody tubes. Pores are numerous on the stem, and small spiral vessels are abundant. The fructification is very simple, without corolla, consists only of spores on the edge of a round disk. The spores are wrapped round by four spiral elastic filaments, called elaters, terminating in dilated flat appendages.

These plants have affinity with Marchantiaceæ.

The stems contain silex, and are slightly astringent.

Equisetum, the sole representative of this small but remarkable Order, on the limits of flowerless plants, derived its name from the Greek for *Horse-hair*, but it is now generally called Horse-tail. The plants of this genus are very unlike all others in their whole construction, and in appearance; yet they have some points of resemblance to other Tribes. Their stems, containing a large portion of silex, connect them with Grasses, and the arrangement of the spores or round scales forms a link with Marchantiaceæ. Although of small size, and apparently not adapted to be of use to man or animals, the abundant quantity of flinty particles contained in the outer part of the hollow stems renders them available for polishing wood and other materials. Thus, as in higher branches of creation, the humble and lowly contribute their allotted share of benefit to the more fully developed. *Equisetum sylvaticum* (1) is a rare British species, found chiefly by the side of rills in Wales. The slender branches are compound, and drooping gracefully from the joints of the stem, produce a very elegant effect. Above each joint is a finely notched sheath surrounding the stem, and small membranous sheaths enclose each branch. Various are the links perceptible between the different plants which botanists have endeavoured to divide into Tribes, according to their structure. The general aspect of this delicate *Equisetum*, bearing a solitary cone of scales above a crown of leaves, is like a miniature resemblance of a Cycas. *E. hyemale* (2) is generally

1. *Equisetum sylvaticum*, *Wood Horse-tail*.
England.

1A *Disk, with Spores.*

1B }

1C } *Spores, wrapped round by elaters,*
1D } *magnified.*

2. *Equisetum hyemale*, *Dutch Rush*. England.

3. *Equisetum fluviatile*, *Great Water Horse-tail*.
England.

3A *Sheath, magnified.*

3B *Stem, magnified.*

3C *Section, magnified.*

3D *Pores of Stem, magnified.*

4. *Equisetum variegatum*, *Variegated Horse-tail*.
England.

EQUISETACEÆ.

known as the Dutch Rush, it grows plentifully on the dykes of Holland, and contains so much silex as to be of great use in polishing. To the Dutch it is invaluable for the constant cleaning required in their damp atmosphere. Sir Humphry Davy was the first chemist who detected the particles of flinty earth, arranged in lines, in the furrowed stem of this plant. Several other species are common in Holland, and may be seen in the month of April sending up their hollow stems, bearing cones, out of the sand, together with the early catkins of the creeping Willow. *E. fluviatile* (3) is the largest British species, the stem, with its whorls of fine branches, rising to the height of three or four feet in favourable watery situations; the branches are rough, with silex on the outside; above each ring is a notched sheath. The fertile stems are very short, destitute of branches, and appear in spring before the others. *E. variegatum* (4) is the smallest English species, the slender stems are all without branches, clothed only with membranous sheaths at the joints. It is to be found chiefly in sandy ground in Scotland and Ireland; the fibres of the root are woolly, as are those of many grasses which grow in similar sandy situations. It has been ascertained, by the use of the microscope, that the particles of silex are frequently arranged in groups, forming chains and curves like the jewels of a necklace; others are placed in simple straight lines, some of the particles not exceeding the 500th of an inch in diameter, yet having a regular axis of double refraction. It appears that these crystalline portions are essential parts of the plant, and assist in the functions of vegetable life. In the lower stem, starch is contained in considerable quantity, and in the autumn it may be observed in active motion, passing up one side and down the other, in *E. fluviatile* and similar large species. The fossil *Lepidodendron* forms a remarkable link between flowering and flowerless plants. *Calamites* is a giant relic of this Tribe in a former vegetation; smaller species of *Equisetum* succeeded it, nearly resembling the present plants.

This Tribe, composed of one genus, comprising many species, is dispersed in most parts of the world, in the Tropics, and in Temperate countries; chiefly in rivers, ditches, and watery places.

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Polypodiaceae
 Polypodiaceae Tribe

LYCOPODIACEÆ.

THE LYCOPODIUM TRIBE.

SMALL herbaceous plants, with creeping stems, and leaves laid over each other, or floating in shallow water with leaves on stalks; sometimes stemless plants, with erect awl-shaped leaves, occasionally rolled up in the bud state. The seeds or spores are contained in cases, one or three-celled, at the base of the leaves, either bursting by distinct valves or whole, and filled with minute powdery matter. The sporules are marked at the top with three small radiating ridges, irregularly rough. The powder is often highly inflammable. The fructification of *Marsilea* and others is of two kinds,—enclosed in involucre either clustered and stalked, or simple oval bodies which germinate, springing either from the root or from the leaf-stalks.

The annular vessels in the stem of *Lycopodium* connect this Tribe with the Ferns. In general aspect, some species bear close resemblance to Mosses.

A few of these plants possess medical properties; others are useful in dyeing.

Lycopodium, the type of this Order, is said to be derived from the Greek for *wolf's-foot*, because of the form of the roots. *L. inundatum* (1) is found only in marshy or boggy places, or on commons where the turf has been pared off, as in several parts of Esher Common, Surrey. It is one of the smallest examples of the genus in England. It has a singular appearance, uplifting its spikes of fructification from the black peat earth. *L. clavatum* is the common club-moss of the north of Britain, very abundant on Highland moors, trailing for a considerable distance over the ground, bearing twin spikes of fructification. The stems are extremely

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| <p>1. <i>Lycopodium inundatum</i>, <i>Marsh Club-moss</i>.
Wet commons, England.
1A <i>Spore-case and leaf</i>.
1B <i>Spore-case, opening</i>.</p> <p>2. <i>Lycopodium acrostachyum</i>, <i>Parasitic Club-moss</i>.
Singapore.
2A <i>Spore-case and leaf</i>.
2B <i>Stalk, magnified</i>.</p> <p>3. <i>Pilularia globulifera</i>, <i>Creeping Pill-wort</i>.
Wet commons, England.
3A <i>Bud</i>. 3B <i>Section of capsule</i>.
3C <i>Section, magnified</i>.</p> | <p>4. <i>Isoetes setacea</i>, <i>Quill-wort</i>. Lakes, Scotland.
4A <i>Capsule</i>. 4B <i>Section</i>. 4C <i>Spore</i>.</p> <p>5. <i>Marsilea polycarpa</i>, <i>Many-seeded Marsilea</i>.
Ditches, Demerara.
5A <i>Section of capsule</i>.</p> <p>6. <i>Marsilea quadrifolia</i>, <i>Four-leaved Marsilea</i>.
Europe.
6A <i>Section of fruit</i>. 6B <i>Pollen case</i>.
6C <i>Spore-case</i>.
6D <i>Stalk-bearing Spores</i>.</p> <p>7. <i>Phylloglossum Drummondii</i>, <i>entire plant</i>,
natural size.
7A <i>Spike of fructification, magnified</i>.</p> |
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rough, closely beset with small leaves, and are often troublesome to cattle by entangling their feet. The sulphur-coloured capsules contain copious minute seeds, which explode readily, and are much used in Germany for fireworks, or artificial lightning in theatres. From their extreme lightness they are useful in various delicate experiments. *L. acrostachyum* (2) is found on trees, banks, and similar situations in the country around Singapore, where the long drooping branches descend in a graceful manner, branching in forks, terminating in slender spikes of fructification; the scale-like leaves arranged in four rows. The fibrous roots are clothed with grey down. *L. helveticum* is abundant in Switzerland and Tyrol, and now generally employed in our conservatories as a verdant ornament throughout the year. *L. phlegmaria* is East Indian, parasitic on trees, from whence it frequently hangs with tufted branches a foot in length. *L. squamatum* is remarkable for its hygrometrical properties: when uprooted and dry, rolling up into a ball; if placed in water, expanding again into a spreading flat shape. Martius found it in the provinces of Bahia and Pernambuco, in South America; and it may be often seen in botanical museums, affording a striking proof of the extraordinary nature of vegetable tissue thus for years preserving its capacity for imbibing moisture and parting from it. In New Zealand *L. volubile* climbs over bushes in the Bay of Islands, with its tough rigid stalk, and spikes on forked branches. *L. arbuscula* was found by Vancouver at Owhyhee. Many species belong to the East Indies:—*L. nummularifolium* has round leaves and drooping spikes; *L. diaphanum* grows in all parts of Tristan d'Acunha; *L. serratum* in Japan. *L. crassum*, resembling the British *L. Selago*, is a native of the Andes, near Antisana, so widely is this genus dispersed over the world. *Pilularia* (3) usually inhabits moist grassy parts of heaths, overflowed during winter; the slender awl-shaped leaves are curled up at first like those of ferns; the spore-cases are placed at the base of the leaves. The capsules of *Isoetes* (4) are lodged in the enlarged base of the leaf, and contain angular spores on slender receptacles; it is rarely found in Britain, except at the bottom of some of the Scotch lakes. *Marsilea* differs from other plants of this tribe, in having flat leaves; but shows trace of imperfect development in some of the stalks, bearing no leaf on their summit. The capsules of *M. polycarpa* (5) are downy at first, but become smooth afterwards. Those of *M. quadrifolia* (6) are in pairs, and stalked. The leaves of *M. vestita* of Columbia are clothed with hairs. *Phylloglossum* (7) is one of the minutest of plants, combining the growth of *Isoetes* with the fructification of *Lycopodium*. *Salvinia* and *Azolla*, both natives of Australia, have rough globose capsules, containing inner spore-cases, filled with small yellow spores. *Lycopodium* is of use in dyeing wool in Scotland and other countries.

This Tribe is most abundant in hot damp localities, particularly in small Tropical islands: but some species are dispersed in all parts of the world, in ditches and inundated places. *Lycopodium* covers vast tracts in Lapland.

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FILICACEÆ.

THE FERN TRIBE.

TREES with a tall stem, and of plants with creeping stems, on or below the surface of the ground. The stem grows at the point only, and contains a loose cellular substance, coated by a fibrous rind, composed of the bases of former leaf-stalks. The wood is full of dotted ducts and tubes. The fronds or leaves are coiled up when young, simple or pinnate. The reproductive organs consist of small spores in cases, arising from the veins on the under surface of the leaves, or on their margin; either on a stalk which encircles it like a ring, or destitute of stalk and ring (10A), springing from the surface of the leaf, or from beneath the outer membrane, which then forms a covering to the spore-cases; sometimes on the margin of contracted leaves. The spores fill the cases irregularly, and are scattered, when ripe, by the bursting of the elastic ring.

This Tribe has affinity with Cycadaceæ.

Astringent mucilaginous properties exist in the fronds. The pith of some tree-ferns makes Sago; the roots or underground stem of some are eatable.

In this remarkable Tribe, all trace of a flower, with its varied and beautiful development of corolla, disappears; leaves are reduced to the most simple structure, and minute seeds are produced on them, without passing through any previous process of change, as in flowering plants. Although the larger number of Ferns are herbaceous, and of small size, yet some are trees with upright stems thirty feet high, rivalling Palms in general aspect, but retaining all the peculiar characteristics of their Order. The stem is marked with large scars, the remains of leaf-stalks. In the centre of the crown the young fronds are seen coiled round, as the stalk elongates assuming the form of a crosier. *Alsophila*, *Cyathea*, and others, are tree-ferns of the isles of the Pacific, and of New Zealand. Roots frequently spring from the stem and enlarge its base. No leaf-buds are developed at the base of the leaf-stalks, consequently no ferns are branched; the forked stem of some arborescent species is caused by the accidental growth of two leaf-buds at the summit. The stem is composed of a mass of tissue in the centre, surrounded by fibrous vessels of a dark colour, easily perceived, even in the stem of our common Brake. *Alsophila gigantea* is widely distributed on mountains in India, but not ascending above

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| 1. <i>Ophioglossum vulgatum</i> , <i>Adder's-tongue fern</i> .
Meadows, England. | 6c. <i>Acrostichum alciorne</i> , <i>Elk's-horn Acrostichum</i> .
New South Wales. |
| 1A <i>Spore-cases</i> .
1B <i>Spores</i> . | 6A <i>Spore-cases</i> .
6B <i>Spore-case with hairs</i> . |
| 2. <i>Asplenium marinum</i> , <i>Sea Spleen-wort</i> .
Coast rocks, England. | 6c <i>Side view</i> .
6D <i>Spore-case, bursting</i> . |
| 2A <i>Spore-cases</i> .
2B <i>Spore-case</i> . | 7. <i>Platyloma ternifolia</i> , <i>Triple-leaved Platyloma</i> .
California. |
| 3. <i>Scolopendrium vulgare</i> , <i>Hart's-tongue fern</i> .
England. | 8. <i>Doryopteris sagittifolia</i> , <i>Arrow-leaved Doryopteris</i> .
Brazil. |
| 4. <i>Adiantum reniforme</i> , <i>Kidney-leaved Maidenhair</i> .
Madeira. | 9. <i>Anemia collina</i> .
Brazil. |
| 5. <i>Fadeyria prolifera</i> , <i>Proliferous Fadenia</i> .
Java. | 10A <i>Section of Spore-cases of Danæa elata</i> .
10B <i>Spores</i> . |

4000 feet. *A. aspera* is a native of Jamaica, with a stem of twenty-five feet. Ophioglossum belongs to that division of Ferns in which the spore-cases have no ring, but are simply two-valved on the margin of the contracted leaf. The stalk is hollow, with a few bundles of woody fibres in the circumference, indicating a similarity of structure to Equisetum. The leaves have netted veins, and are not coiled up when young. *O. vulgatum* (1) is one of the earliest of our Ferns, appearing in meadows before the grass is much grown. *O. pendulum* is parasitic on trees in the Mauritius with a frond three feet long, and a drooping spike of fructification nearly a foot in length. Botrychium *lunaria*, an English Fern, is an example of a branching spike formed by the transformation of a frond. Several larger species belong to N. America; *B. cicutarium* to St. Domingo. Asplenium *marinum* (2) shows the linear masses of spores springing from beneath the outer membrane, which bursts along the edge by the elastic force of the spore-cases. This Fern grows on rocks and in caves without any apparent source of nourishment except the saline moisture of the air. *A. Trichomanes* adorns stone walls in the northern countries with its slender, wiry-stalked fronds. The genus is dispersed in the East and West Indies, and America; *A. imbricatum* is found at 16,000 feet on the Andes. Scolopendrium (3) unrolls its numerous long fronds generally in moist, shady places. Adiantum *reniforme* (4) is a simple frond; *A. Capillus Veneris*, the graceful *Maiden-hair* of the West of England, is finely divided, as are several West Indian species. Some Ferns have the power of producing buds at the ends of the fronds, which send forth roots, and become a separate plant. Fadyenia (5) is an example. One of the finest of Australian Ferns is Acrostichum *aleicorne* (6), commencing its growth, like many others, by a flat, reniform leaf; out of the centre rise erect fertile fronds, bearing masses of spores at their ends. *A. tripartitum* creeps over the stems of trees at Esmeraldas, on the Andes, at 5000 feet. Anemia (9) is a very elegant species of Brazil. One of the most common British Ferns is Polypodium *vulgare*; the horizontal stem spreading on the ground, or on trees, covered with brown scales, sending up bright green fronds, bearing golden spots of spore-cases on their under side. The roots contain carbonate of potash. *P. gracile* is an extremely beautiful species of the Andes at 16,000 feet. Cryptogramma *crispa* is almost limited to the mountains of Westmoreland and Cumberland, in this country; it is represented by a nearly similar species on the Himalaya, on the Andes at the elevation of Quito, and at Nootka Sound in 60° N. Lat. Pteris *aquilina* of Europe is found at 4400 feet on the Himalaya. The noblest English Fern is Osmunda *regalis*, flourishing by the side of mountain streams. Hymenophyllum and its nearest allies are minute in size, trailing over wet rocks, damp ground, and trees, with a slender stem devoid of scales, sending out fronds of the most simple substance, the spores contained in a cup attached to a prolongation of the vein of the leaf. II. *Tunbridgense* is a very delicate species. Several are natives of the East and West Indies. The under surface of the fronds of Cheilanthes *farinosa*, of Nepal, is covered with a white meal; that of Gymnogramma *sulphureum* is a pale yellow. Davallia *canariensis* has been named the Hare's-foot Fern, from the resemblance of the hairy stem lying on the earth. This genus is found in many hot countries, and one small species grows in the crater of Owhyhee. In a former state of the globe, Ferns were a large part of the vegetation, as may be distinctly traced in coal-mines.

Tree-ferns belong exclusively to the Tropics and the isles in neighbouring latitudes. Herbaceous Ferns are dispersed in all countries in diverse proportions. Less than 200 are natives of Temperate climates; about 2600 grow in Tropical regions; they abound most in hot, moist islands.

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BRYACEÆ.

THE MOSS TRIBE.

THIS Order contains small herbaceous plants, of cellular tissue only, terrestrial or aquatic, having fibrous roots, creeping or erect, covered with minute imbricated leaves, entire or serrated at the edges. The reproductive organs are of two kinds, cylindrical bodies at the base of leaves containing small round particles and coiled up threads which move in water, and capsules or spore-cases on a stalk covered by a membranous calyptra, closed by an operculum or lid, beneath which are one or two rows of stiff cellular teeth called the peristome. A series of elastic cells is called the ring (10). In the centre of the spore-case is the column surrounded by spores. The spores germinate on the surface of the ground or on the trunk of trees, they produce first filaments thickly interlaced, like those of Conferva, from the joints of which leaf-buds spring.

These plants have close affinity with the Liverwort tribe by Jungermannia, but are distinguished by having an operculum to the spore-case.

Slightly astringent properties exist in Polytrichum and others.

Mosses are amongst the lowliest classes of vegetation, and afford very little direct use to man or animals; yet they perform an important part in the great plan of creation, and though of minute size assist in countless numbers in the first work of covering barren rocks or volcanic soil with verdure, thus preparing the land for more valuable herbage. A great similarity prevails throughout the tribe, but endless variety is found in different species, both in the arrangement of the parts and in the manner of growth. Some form dense tufts not rising to the height of an inch, others grow more separately and imitate the aspect of more highly developed plants. The spore-case or urn is not always symmetrical on its stalk, in some species it is larger on one side than the other; the length of the stalk varies extremely, in some instances scarcely elevating the spore-case above the leaves, in others attaining several inches in height; it proceeds either from the ends of the branch, or from the side. Bryum (1), an ancient Greek name for moss, has been selected to give its name to this Tribe, being one of the most perfect in its various parts. The peristome of the spore-case is double, the outer terminating in sixteen teeth with a double

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| 1. <i>Bryum ligulatum</i> . Moist banks, England.
1A Leaf magnified. | 6. <i>Hypnum Menziesii</i> . Dusky Bay, N. Zealand. |
| 2. <i>Sphagnum latifolium</i> . Bogs, Britain.
2A Leaf. 2B Spore-case. | 7. <i>Leucodon tomentosus</i> . South America.
7A Spore-case and Peristome. |
| 3. <i>Dicranum glaucum</i> . Heaths, England. | 8. <i>Hypnum montanum calyptroides</i> . East Indies.
8A Spore-case. |
| 4. <i>Polytrichum commune</i> . Heaths, Britain.
4A Peristome. 4B Teeth. 4C Leaf.
4D Section of Spore-case. 4E Column. | 9. <i>Andræa nivalis</i> . Mountains, Britain.
9A Spore-case and lid. |
| 5. <i>Orthotrichum crispum</i> . Trees, England.
5A Veil. 5B Spore-case. 5C Leaf. | 10. Spore-case and ring of <i>Bryum</i> .
11. Operculum. |

row of cells, the inner or plaited membrane with single-celled teeth. The calyptra, or veil, is a smooth hood. The leaves are arranged in several rows and have a membranous notched edge. This genus grows very abundantly in various localities; in primæval forests and on plains in the Tropics, on arid Polar steppes, in low marshes and on lofty mountains, on sandy ground and on old walls, in Temperate climates. *Sphagnum* (2) is an example of a moss the spore-case of which has no peristome; the small mitre-shaped veil soon falls off, the flat operculum is detached when the spores are ripe. Several of the species are to be found in peat-bogs and form a large portion of the composition of peat; their spongy nature absorbs much moisture, both from the air and soil. On the borders of marshes on the Sikkim Himalaya at 6000 feet, as well on level plains in Europe, *Sphagnum* will be observed. In Lapland it is food for reindeer, and it has been said that in the Arctic regions a kind of bread is prepared from it. On dry, sandy heaths and moors, in shady ravines, on mountains near the limits of perpetual snow, *Dicranum* (3) grows in thick masses, particular species in such situations as are adapted to them. The peristome has a single row of double-celled teeth. *D. fulvum* belongs to Nova Scotia, *D. flexuosum* to the Cape, *D. vaginatum* to the Andes, in valleys between 3000 and 4000 feet. *D. fragile*, nearly resembling our *D. scoparium*, is found in Nepal. *Polytrichum* (4), the largest and finest of British mosses, is very common on heaths, hedge-banks, and elsewhere. The stems producing only tufts of small leaves, in which are simple cylindrical cases of spores, are light and elastic, and in Norway are used to stuff beds and cushions; it is in the most northern countries that mosses are employed in the service of man. *P. commune* has some peculiarities of structure, the top of the column is expanded into a circular plate, through the pores of which the minute powdery spores are scattered. The calyptra is at first smooth, but becomes clothed with an outer coat of fine hairs, surrounding the thin membranous hood. The different species exist in all parts of the globe, *P. sexangulare* spreading its green stems over the higher Alps, *gracile* and others abounding in marshes, *P. juniperinum* inhabiting dense forests. *P. giganteum*, an enlarged resemblance of *P. commune*, grows on the Palm Ceroxyton *andicola* at 1900 feet on the Andes. Other species belong to North America and New Zealand. *Orthotrichum* (5) belongs almost exclusively to trees, seldom on rocks or stones,—even the species are confined to particular kinds of trees. *O. Lyellii*, the finest species, is only found on trees in the New Forest in this country. *Hypnum* is a very extensive genus, adorning the ground throughout the year with brilliant verdure, the prostrate or erect branches clothed with fine leaves. *H. crista-castrensis* is the most rare as well as beautiful of our species. *H. Menziesii* (6) is a very fine specimen from New Zealand. *Leucodon* (7) produces stalks with spore-cases from small tufts of leaves, not at the end of leaf-branches. The leaves of *Hymenostoma* (8) contain pores, as have been discovered also in other mosses. The outer coat of the spore-case is sometimes thick and fleshy at the base enlarged in *Splachnum* into an apophysis. *Andreaea* differs from all other mosses, approaching to *Jungermannia* in the splitting of the valves. It has, however, the true operculum of this tribe, and the valves remain united at the top. *A. nivalis* (9) is found on high mountains attaining the verge of eternal snow.

The plants of this Tribe are dispersed in every part of the world wherever any vegetation can exist: most abundant in Temperate climates. They cause the first verdure on extinct volcanoes, or barren rocks, both in Southern and Northern latitudes, extending to the Isles of New South Shetland, and forming more than a quarter of the scanty Flora of Melville Isle.

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MARCHANTIAEÆ.

THE LIVERWORT TRIBE.

CREeping herbaceous plants, of cellular tissue, with leaves and axis combined in a leafy expansion or frond, having pores on the upper surface, emitting rootlets from the lower surface; sometimes having separate leaves surrounding a central axis. The fructification is of two kinds, spore-cases elevated on a stalk, or cups springing out of the inner layer of the frond containing small bodies capable of producing new plants. In the disk of the stalked spore-case are oval bodies enclosing filaments rolled up in the cells. The radiated disk has spore-cases on its under surface full of spores and spiral elaters, which by their elastic force scatter the spores. The spore-cases open by irregular fissures, or separate teeth or valves, and are either with or without a central column. The spores are globose, mixed with spiral elaters. Riccia and others have no elaters.

This Tribe is connected with Mosses by Jungermannia, but is distinguished by having no operculum to the spore-case. Riccia forms a link with Lichens. A few of these plants have a slight fragrance and subacid taste.

Marchantia, chosen for the type of this Order, was named after one of the first members of the Académie des Sciences, in Paris, in 1666. It is a genus of soft creeping plants, with green fronds, usually growing on wet rocks or ground, or on the margins of wells. The frond has no mid-rib, but is intersected with fine lines forming lozenges, in each of which is a pore or stomate like those of flowering plants. *M. polymorpha* (1) is frequent on stones in damp shady courts, but grows most luxuriantly on wet rocks in Scotland. The stalked spore-cases appear to require the full light of the sun for their development; in the shade the small cups imbedded in the frond are more plentiful. These contain cells of spores which become detached and produce new plants. The fronds also have the power of

1. <i>Marchantia polymorpha</i> .	Wet places, Britain.	8. <i>Pellia epiphylla</i> .	England.
1A Cup.	1B Spore-cases.	9. <i>Anthoceros laevis</i> .	France.
2. <i>M. hemisphærica</i> .	Britain.	10. <i>Durinea helicophylla</i> .	Algeria.
2A Spore-case.	2B Elater.	11. <i>Riccia nudichotoma</i> .	France.
3. <i>Marchantia assamica</i> .	Shores, Assam.	12. <i>Jungermannia bidentata</i> .	England.
3A Spore-cases.	3B Spores and Elaters.	12A Spore-case and leaves.	
4. <i>Reboulia graminosa</i> .	East Indies.	12B Spore-case.	12C Sheath of Spore-case.
5. <i>Lunularia vulgaris</i> .	France.	12D Globule.	12E Spore-case.
6. <i>Aveura proceros</i> .	France.	13. <i>Jungermannia sinuosa</i> .	
7. <i>Targionia hypophylla</i> .	England.		Dusky Bay, N. Zealand.
		13A Leaves and Stipules.	

MARCHANTIACEÆ.

increasing by adding new portions, which afterwards separate and grow into fresh plants. *M. hemisphærica* (2) grows in similar situations, preferring moist rocks or ground, clinging by the fine rootlets, and absorbing moisture by the numerous pores of the fronds. *M. ossanica* (3) is an example of the tribe from the shores of the Burrampootur and Koondil, where it was found and described by the late diligent botanist, William Griffith. The genus named *Rebouilia* differs but little from *Marchantia*, chiefly distinguished by the disk of the spore-cases not being deeply lobed. *R. graminosa* (4) grows on shady banks at Otipore in Bengal, mingled with other plants of like nature. *Lunularia* (5) has a spore-case opening into four or eight valves at the top of a hairy stalk. In the park of Chantilly this little liverwort may be seen in perfection on the stones in the small rivulets which traverse the grounds. Another genus, combining a four-valved spore-case with a flat frond, is *Aneura* (6). *Targionia* (7) records the name of a Florentine who introduced botanical lectures in the course of instruction prepared for medical students. The spore-cases are stalkless, solitary, placed at the end of the frond on a slight rib. *Pellia epiphylla* (8) has a four-valved spore-case on a stalk proceeding from the mid-rib. *Anthoceros* (9) is known by the horn-like shape of the slender spore-case, which splits into two parts from the central column, leaving the spores and elaters to escape. *A. punctatus* and other species are natives of England. An exceedingly elegant little plant has lately been discovered in Algeria, and described by M. Montagne in the Flora of that country. *Duriæa helicophylla* (10), with its narrow frond, of a bright green colour, twisted in a spiral manner, presents a very remarkable appearance; its erect growth also contrasts with the prostrate, creeping nature usual in this tribe. The fructification consists of spores on minute bract-shaped bodies attached to the central column. *Riccia* (11) was so called in memory of a Florentine botanist, in whose time the structure of these little plants was not so accurately known as at present. The spore-case rests on the frond enclosed in a two-valved sheath. *Ruppia* selected the various species of *Jungermannia* to record a German botanist born in 1572, who spent a long life in exploring the vegetation of his own country and of Switzerland. In form and manner of growth they are closely allied to Mosses. *J. bidentata* (12) may be found in moist places bearing fructification in the autumn. All the British species have alternate distinct leaves, two in New Zealand have leaves opposite and united. Some have stipules on the under side between each pair of leaves, either entire or toothed. The so-called anther is a round pellucid membrane full of a fluid with granules, which escape at an irregular opening. The spore-cases are on slender stalks, and burst at the top when ripe into four valves, the spores being expelled by the elastic spiral filaments. *J. gigantea* of New Zealand is the largest known species.

This Tribe is scattered in all countries, very abundant in the Tropics, as well as in Europe, wherever there are shade and moisture. Several European species belong also to N. America, Brazil, and the Cape. Two species have been found in Melville Isle.

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Thalictrum flavum
Thalictrum flavum

CHARACEÆ.

THE CHARA TRIBE.

AQUATIC plants, of a brittle nature, always submersed, growing in stagnant or salt water, with a stem composed of parallel tubes which are either transparent or encrusted, having regular whorls of symmetrical or tubular branches. The reproductive organs are round, succulent, red globules, placed below the whorls of branches, and oval bodies above the leaf or branch; the outer covering of the upper capsule is transparent, and terminates in five teeth at the top; the inner portion is hard and dry, composed of five narrow valves, filled with granules of starch. The small red globule is formed of several scales, which separate and cause it to open when ripe; the interior is filled with a mass of elastic, transversely-waved filaments.

This Tribe has affinity with Naiadaceæ, and in some points of structure with Sea-weeds.

The stems of Chara secrete lime.

These plants, of apparently insignificant rank in the vegetable kingdom, and of no known use, possess nevertheless considerable interest, both in their past and present history. It is a tribe of comparatively recent date, no vestige of it being discovered in the earliest series of rocks. Ferns and Palms were created before Chara was called into existence; in the lower fresh-water formation are first found the fossil relics of Gyrogonites, a giant representative of these aquatics, in a period when vegetation began to acquire some of the forms which exist at the present time in living plants. The true species of Chara are remarkable for the large portion of carbonate or phosphate of lime which they contain, acquiring for them the name of *stone-worts*; in some instances so abundant is the lime, that the whole form of the plant remains perfect after the organic membranes have been removed. In fens they add yearly earthy deposits which tend to the elevation of the soil. The odour arising from them in low marshy ground is very unpleasant,

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| 1. <i>Chara vulgaris</i> . Common Chara. | |
| Ponds, England. | |
| 1A Branch, with fructification. | |
| 1B Upper capsule. | 1C Globule. |
| 1D Capsule, sprouting. | |
| 1E Motion of fluid within each joint. | |
| 1F Stem. | 1G Section. |

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| 1H Filaments of globule. | |
| 1I Phytozoon of filament. | All highly magnified. |
| 2. <i>Nitella flexilis</i> , Smooth Nitella. | |
| Ponds and rivulets, England. | |
| 3. <i>Nitella translucens</i> , Great transparent Nitella. | |
| Pools, England. | |

T T

CHARACEÆ.

and is said to be one of the causes of the unhealthiness of the Campagna of Rome. *Chara vulgaris* (1) is very common in muddy, stagnant ditches throughout England, and other countries of Europe; the root is fixed in the mud, the plant growing up to the surface, but never rising above it; the scent is very nauseous. *Nitella* is chiefly distinguished as a genus by the want of any secretion of lime, and the stem being composed of a simple tube, not spirally striated. *N. flexilis* (2) is quite smooth, without any small prickles; found in several parts of the country in ditches and ponds: the slender branches are either undivided, forked, or three-cleft. *M. translucens* (3) is our largest species, found only rarely in pools in Scotland; the root is creeping, of many-branching slender fibres, with small knots. *N. gracilis* is the slender species occasionally seen in bogs. Australia affords several examples of this tribe, and in this instance the same law prevails as in other and higher branches of creation; those species which are the most prevalent in the rest of the world are the least represented, or scarcely seen in Australia. Of *Nitella* twelve species have been discovered; *N. microphylla* is of very delicate growth and texture, with transparent stems. *N. gleostachys* of the Swan River has the spikes surrounded by a glossy, pellucid jelly, giving it a beautiful iridescent appearance. *N. subtilissima* is nearly the smallest species of the tribe. *N. antarctica* closely resembles *N. nidifica*, an inhabitant of salt water in the north of Europe, and peculiarly found in the shallow borders of the Baltic. Many curious observations have been made at different times on the circulation of the fluid in the stems of these plants. Corti, of Lucca, first observed it in 1774. Treviranus continued the examination in 1817, but it was not generally known to be perceptible to any observer with a good microscope, until Amici made more extended researches at Modena. Since then, English and French botanists have confirmed the fact as an undoubted addition to our knowledge of the physiology of plants. Another interesting observation on this tribe is, that on the phytozoa contained in the cells of the filaments in the globule are two vibratile cilia, which possess spontaneous movement, and thus appear to connect this lowly tribe of plants with the lowest amongst animals.

This Tribe is found in stagnant water, either fresh or salt, sometimes in rivers, always submerged; most abundant in Temperate countries, but growing in almost every part of Europe, Asia, Africa, America, and Australia.

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LICHENACEÆ.

THE LICHEN TRIBE.

PERENNIAL flowerless plants, of cellular tissue, forming a shallus, often spreading over the surface of the earth, or on rocks or trees, usually in dry places; of a leafy or lobed form, or hard and crustaceous, or of a mealy substance. The shallus is composed of two layers, the outer one simply cellular, the inner one cellular and filamentous. In the crustaceous species the outer layer alone contains colouring matter. The reproductive organs are of two kinds, either spores lying in small shields which burst the outer layers and expand on the surface, or separated green cells of the inner layer called gonidia (12), which remain beneath the outer layer or break out in clusters or in cups. The plants are developed in humidity, then become a dry powdery crust out of which grow the living vegetating cells filled with reproductive matter.

This Tribe has close affinity with the sea-weed and the fungus tribes, having in many instances the growth of a sea-weed, and the fructification of a fungus.

These plants are mucilaginous and contain medicinal and nutritive properties. Lichens are the first agents of nature in the work of forming vegetable earth. The most simple, powdery, almost invisible species are developed on volcanic ground and rocks, in decomposing the surface of which they add to the soil, and other lichens are thus enabled to find support for their slender rootlets. To these succeed mosses, and afterwards larger plants. Thus through successive years the work proceeds, till barren rocks rising out of the ocean, coral reefs, and pumice plains around volcanoes, became converted into fertile land. The old name of *time-stains* is admirably expressive, they are the gradual produce of time, clothing aged trees, ancient edifices and ruins, and giving the peculiar hoary aspect to some rocks. The pale hue of the granite on the coast of Cornwall at the Land's End is entirely

1. <i>Cetraria islandica</i> .	Britain.	5. <i>Cenomyce pyxidata</i> .	Britain.
1A Shield.		6. <i>Cenomyce rangiferina</i> .	Britain.
2. <i>Sticta pulmonacea</i> .	Trees, England.	7. <i>Cenomyce uncialis</i> .	Britain.
2A Section of Shield.		8. <i>Stereocaulon paschale</i> .	Moors, Scotland.
3. <i>Roccella tinctoria</i> .		8A Fructification.	
	Sea-coast rocks, England.	9. <i>Varilario lactea</i> .	Stone walls, England.
3A Shields.	3B Section.	9A Shields.	
3C Spores.		10. <i>Ramalina fraxinea</i> .	Trees, England.
4. <i>Parmelia parietina</i> .		11. <i>Usnea barbata</i> .	Firs, England.
	Walls and trees, England.	12. <i>Shield with Gonidia</i> .	
4A Shield.	4B Spore-cells.		
4C Spores.			

owing to the lichens which cover the surface. One of the most valuable of this lowly tribe as yielding nourishment to man is *Cetraria islandica* (1). It is found on Ben Lomond, the Pentland Hills, and other parts of Scotland, but grows more abundantly in the northern countries of Europe. On the old lava of the west coast of Iceland it finds a very suitable locality, and attains there a luxuriant growth, which has given the name to the species. By steeping in cold water it loses the bitter principle and affords an important ingredient in the simple fare of the poor Icelanders, who eat it boiled in milk, and make also a kind of meal from it for cakes. Large quantities are collected and exported under the name of *Iceland moss* to England and Germany, where it is considered a good remedy for consumption. It has also been employed in brewing and in making ship biscuits. In time of scarcity in Saxony the meal has been mixed with wheat flour for bread. *Sticta* (2) was so named from the Greek on account of the numerous small pits on the under surface. It is the finest of British lichens, growing always on trunks of trees; the properties are nearly similar to those of *Cetraria*. *Roccella tinctoria* (3) is the celebrated Portuguese orchall, yielding a fine purple dye, supposed to be the same known to the ancients in the time of Dioscorides, and collected on the rocky islands of the Greek Archipelago. *R. fruticiformis* abounds on the shores of Sumatra and other East Indian isles. In autumn the branches of trees and stone walls in almost every part of our country, except in large cities, may be seen profusely covered with *Parmelia parietina* (4); the golden shallus and shields contain a peculiar colouring matter called *Parietin*, when mixed with alum it affords a good yellow dye. *Cenomyce pyxidata* (5) is the most elegant of all our lichens, is very frequently found on dry heaths and sandy banks, sometimes popularly called *fairy cups*. When the fructification is ripe, and of a bright red, it has a remarkably pleasing effect. Several other species belong to this genus, of varied form and appearance. *C. rangiferina* (6) forms the chief food of the reindeer during the long winter in Lapland, the instinct of the animal directing him to the spots where it lies deeply covered with snow. *C. nucialis* (7) is to be seen on Scotch moors, conspicuous amongst green mosses from its silvery hue. *Stereacaulon* (8) is the fast branching lichen that clothes the lava of extinct craters, and occupies the interstices of barren rocks. Of the crustaceous kinds, *Variolaria* (9) is common on rocks or ground. *Ramalina* (10) is an example of those which have the shield of fructification formed out of the substance of the shallus. In the same section is *Usnea* (11), well known to travellers amongst the Alps of Switzerland, hanging in long drooping bunches from the branches of firs, commonly called *old man's beard*. *Lecanora tartarea* yields Cudbear, used in dyeing wool a pale red, it grows abundantly in Scotland, and is also imported from Norway. Several species of *Cyrophora* are known to Canadian hunters as *tripe de roche*, affording them subsistence in wild districts when nothing better is to be obtained. The wandering tribes of Asiatic deserts eat likewise some of the mealy lichens. The north side of trees or rocks is usually most favourable to these plants. The scorching rays of the sun parch them; they are never found on decaying matter, sometimes on ever-green leaves in the Tropics. Those which grow on the top of firs have been found to contain a large proportion of oxide of iron. Lichens have not been discovered in a fossil state.

This Tribe is scattered over the whole world, many species grow equally in various countries. The finest examples are found near the Equator, the smaller crustaceous species in the Polar regions, or on lofty mountains, scarcely discernible from the rocks to which they are attached.

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F U N G A C E Æ.

THE FUNGUS TRIBE.

PLANTS composed of cellules, or filaments, or both, increasing in size inwardly, the outside not changing; growing chiefly on decayed animal or vegetable substances; of short duration. The fructification consists of spores attached externally and often in definite numbers to the cellular tissue, or placed on projections like stalks, or enclosed in membranous bags: other bodies appear to be similar to anthers. The most simple form of Fungus is composed of small jointed filaments, with cellules placed end to end, such as mould and mildew; spores are contained in each cell, or are collected in terminal joints. The spores germinate readily, and the young plants grow with excessive rapidity and force of development.

This Tribe has affinity with Lichens and Sea-weeds; but differs from the former in not containing germs full of green matter,—from the latter in possessing no spontaneous motion in the reproductive particles,—and from both in deriving nourishment from the substance on which they grow.

These plants contain abundant nitrogen, absorb oxygen, and exhale carbonic acid. Some are wholesome, others poisonous.

This lowly Tribe, approaching the verge of vegetable life, of extremely simple structure and fugitive existence, possesses nevertheless considerable interest, not only from the varied forms of the plants it comprises, but from the important part they perform in the transformation of vegetable matter. Many grow on dead or decaying animal or vegetable substances, which they speedily help to disintegrate, thus causing a rapid conversion to earth or mould, reducing what was become injurious to the living to a fresh source of support and sustenance for the future. In low damp situations, as the islands in the Bay of Rio Janeiro, plants of all

1. <i>Agaricus campestris</i> , <i>Field Mushroom</i> . Fields, England.	5. <i>Boletus sanguineus</i> . England.
1A <i>Spores, magnified</i> .	6. <i>Polyporus squamosus</i> . Stems of trees, England.
2. <i>Amanita muscaria</i> , <i>Poisonous Amanita</i> . Woods, England.	7. <i>Scleroderma citrinum</i> , Roots of trees, England.
3. <i>Agaricus luteus</i> , <i>Yellow Agaric</i> . Grass, England.	8. <i>Peziza coccinea</i> . England.
4. <i>Boletus subtomentosus</i> , <i>Downy Boletus</i> . Woods, England.	8A <i>Spore cases and filaments</i> .
4A <i>Section of cap</i> . 4B <i>Cell, with spores</i> .	9. <i>Cyathus striatus</i> . England.
4C <i>Spores</i> . 4D <i>Spores</i> .	10A <i>Mucor mucedo</i> , <i>Mould</i> .
	11A <i>Botrytis curta</i> . <i>Leaves</i> .
	12A <i>Erineum juglandis</i> .

kinds spring forth, grow and decay, with wonderful rapidity; when a large tree is felled, the stem speedily becomes a fine earth, the process being hastened by the growth of countless fungi, which are developed as soon as decay commences. In the simplest form of this Tribe, the species of mould (10) and mildew are composed of cells placed end to end; some of the joints separate and reproduce fresh plants; in others, the spores accumulate in the cells, and are dispersed when they break. In the more perfect plants of this class, the masses of cellular tissue assume a determinate figure, the whole central portion being occupied by plates or cells, with spores attached. The most valuable of these plants as food is *Agaricus campestris* (1), the Mushroom; the gills are plates containing countless spores. Although this tribe is generally of a dull colour, yet some species are as bright as those of more highly developed plants. *Amanita muscaria* (2) adorns woods in autumn with its brilliant crimson cap. *Agaricus xerampolius* is the most splendid species, of various tints of red and yellow, grows commonly in Italy, and was esteemed a delicacy by the ancient Romans. The cap of *Boletus* (4) is porous on the lower part, the cells being separable from the cap and each other, each fringed internally with spores. *B. sanguineus* (5) is not uncommon in woods. *Polyporus* has no central stem, and the tubes are attached to the cap and to each other. *P. squamosus* (6) is one of our largest examples, growing on the stems of trees. *P. tuberaster* is an article of food in Italy. *P. annosus* is used in Sweden as a cure for the bite of snakes. *P. fomentarius* is still made into tinder in poor countries. *Scleroderma* (7) is to be found about the roots of trees, the interior filled with spores collected into globules mixed with filaments, which escape by an opening at the top. The Puff-ball, *Lycoperdon*, a nearly similar genus, abounds in grassy places, in a variety of species. *Bovista gigantea* is the giant of the Tribe, sometimes more than two feet in diameter; the outer skin cracks, the inner one bursts at the top, and the small stalked spores are dispersed. The growth is wonderfully rapid; one was observed, during a damp night, to grow from a mere point to the size of a large gourd, at the rate of 66,000,000 of cells in a minute. *Peziza* (8) is found chiefly on decayed wood, its spores contained in the hollow of its leathery cup. Amongst withered leaves on the ground may be seen the beautiful little *Cyathus* (9); within the cup are a few white capsules, fixed by a thread to the sides and base, full of minute spores. *Nidularia crucibulum* is a very neat species on old wood. Besides the eatable Mushrooms, others afford a delicious ingredient of cookery to refined palates; several more are valuable as nourishment to peasants in remote uncultivated districts. The most delicate are *Morchella*, the Morel; and *Tuber cibarium*, the Truffle, growing under the surface of the earth, black on the rough exterior, white within. *Mylitta australis* serves as food to natives and kangaroos. *Botrytis* (11) is a magnified example of the minute kinds which are found on withering leaves. *Erineum* (12) is scarcely more than a monstrous growth of the cells of the walnut leaf. Many singular experiments have been made on the rapid changes of colour in these plants, apparently not due to chemical action. *Rhizomorpha* has some luminous properties, which cause it to shed light in coal-mines and rocky caves in Saxony. Dutrochet found the greatest degree of vegetable heat to exist in a *Boletus*. Plants generally purify the air by absorbing carbonic acid: these render it less wholesome by absorbing oxygen and exhaling carbonic acid, but they make vast compensation by decomposing decaying vegetable matter.

This Tribe, comprising infinite numbers, is dispersed over the whole world in indefinite geographical limits. *Agaricus* and *Polyporus* are most numerous in species.

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F U C A C E Æ.

THE SEA-WEED TRIBE.

PLANTS composed of cellular tissue, inhabiting chiefly salt water, sometimes in fresh water, or hot springs; some grow in mud, others are attached to rocks. The frond is either composed of a single cell uninterruptedly branched, or of several cells of various forms, placed one above the other or interwoven, jointed or continuous, thread-shaped or of various figures, not uncommonly divided into a sort of stem and leaf. The fronds grow by division of the cells, and become branched by increasing at the sides. The plants are propagated by spores contained in bladdery vesicles scattered throughout the whole frond, or placed at the ends of the branches. Some are reproduced in two separate forms, rounded capsules, and minute ternate granules. The spores of some are furnished with fine hairs, which have power of motion for a few hours before the spore begins to vegetate.

This Tribe has affinity with Characeæ.

These plants absorb carbonic acid and respire oxygen by day, and absorb oxygen and exhale carbonic acid by night. Some contain Iodine.

In each class of creation the lowest tribes are developed in water. Sea-weeds on the verge of vegetable life can exist only in water, or moisture. To the greater portion water is essential during the whole period of their existence. They have no vascular tissue, therefore no circulation of fluids; they absorb water only by the parts in immediate contact with it; the most expanded fronds have no power of conveying moisture to the rest of the plant, neither can the roots obtain nourishment by their points as those of higher tribes. They serve merely to attach the plant to the rock, and prevent it from being floated away by waves; it matters not whether it be granite or marble, if it be only solid and favourably placed. *Fucus*, which has given its name to the whole Tribe, is a very extensive genus, abounding on the coasts of the British Isles. *F. vesiculosus* (1) is of considerable value in making kelp. The receptacles lined with spores are at the ends of the branches; the air-vessels are in pairs throughout the frond. The Western Isles

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|----------------------------------|--------------------------|------------------------------------|-----------------------|
| 1. <i>Fucus vesiculosus</i> . | Coast, Britain. | 4c Spores on Frond. | 4D Spores. |
| 1A Section of Receptacle. | | 5. <i>Iridæa edulis</i> . | Shores, Scotland. |
| 1B Spores. | 1c Spores and Filaments. | 5A Spores. | |
| 2. <i>Fucus nodosus</i> . | Coasts, Britain. | 6. <i>Sargassum bacciferum</i> . | Atlantic Ocean. |
| 3. <i>Himanthalia lorea</i> . | South coast, England. | 6A Receptacles and air-vessels. | |
| 3A Section of Receptacle. | | 7. <i>Furcellaria fastigiata</i> . | Shores, Britain. |
| 4. <i>Delesseria sanguinea</i> . | | 7A Section of Receptacle. | |
| | South coast, England. | 8. <i>Ulva crispa</i> . | Damp gravel, England. |
| 4A Receptacle. | 4B Section. | 9. <i>Botrydium granulatum</i> . | Gravel, England. |

of Scotland derive much benefit from this species; not only is it used for kelp, but it serves also as winter food for cattle; when dried it is used as fuel, and the ashes are laid over cheeses to dry them. *F. nodosus* (2) is like other species, very tough and leathery, growing to a large size in deep water. Some have receptacles of great length, forming nearly the whole plant, the spores immersed in them irregularly, as *Himanthalia lorea* (3). In the same section of this tribe is one of the most remarkable examples of extended growth, the genus *Sargassum*. *S. bacciferum* (6) does not grow on the British coast, but is often washed ashore on the Orkney Isles from the Atlantic. In S. America it is thought a remedy for goitre. A large mass of this species, as well as of *S. vulgare*, exists in the Atlantic between 19° and 34° of N. lat. west of the Azores, the same floating meadow which impeded the ships of Columbus on his voyage of discovery. Another lesser mass is observed between Bermuda and the Bahamas. The largest British sea-weeds belong to the genus *Laminaria*; the frond is flat and extremely tough, has no mid-rib; the fructification forming dense spots embedded in the thickened surface of the frond. The stem of *L. bulbosa* is much waved at the margin, and bears a frond deeply cleft. *L. digitata* has a stem of 6 feet, with a frond often more than 15 feet in length, divided into numerous segments. When dry it is covered with salt, which has a sweetish taste and has given the specific name. The stem of *L. pottatorum* of New Holland is of a size to serve as water-vessels. *L. buccinalis* is the great Trumpet-weed of the Cape. *Seytosiphon filum* grows to 40 feet in the bays of the Orkney Isles. *Alaria esculenta* has a frond of upwards of 20 feet, the surface covered with pores, from whence issue tufts of filaments. But the giant of the tribe and of all vegetation is *Macrocystis pyrifera*, 1500 feet long, floating in southern latitudes. *Delesseria* is the most beautiful of British sea-weeds; *D. sanguinea* (4) retains its brilliant hue when dried, adhering to paper. The fructification is of two kinds, round capsules containing a globular mass of seeds, or ternate granules, scattered in the frond or in small leaf-like processes on a mid-rib from which the rest of the leaf has fallen away. Amongst the eatable kinds known as Dulse in Scotland is *Iridaea edulis* (5) of a very succulent nature, yielding a fine red dye if prepared with alum. *Rhodomenia palmata* is mucilaginous, and affords wholesome food to sheep in Norway; it is eaten in Edinburgh by the poor. The Icelanders also make it part of their humble fare, either raw or boiled in milk. *Furcellaria* (7) is a genus of dark coloured species abundant on all European coasts; the cylindrical receptacles fall off when ripe, leaving the branches to grow again. A terrestrial example of this Tribe is *Ulva crispa* (8), to be found in winter on damp ground in shaded places. The granules are arranged in regular lines forming squares, for even in this lowly plant beauty and order are perceptible. Still lower in the rank of plants is *Bättydium* (9), composed of minute vesicles filled with a fluid which escapes at the top, and the plant becomes cup-shaped. Yet more simple and lowly is the *Protococcus nivalis*, the red snow of the Polar regions and of the Alps; consisting of minute globules of red fluid, bursting when ripe. The gelatinous nature of many sea-weeds renders them useful to the Chinese and other Eastern nations, as food, glue, or varnish. Some are employed as dyes.

This Tribe exists in salt or fresh water all over the globe, forming extensive forests in the depths of the ocean, and floating on its surface in prodigious masses, comprising the largest examples of vegetation, and the most minute. Some species are found in boiling springs, others on perpetual snow. *Durvillea* extends to 61° S. lat.; *Seythalia* as far as 63°.

CONCLUSION.

A DESIRE to illustrate and describe in simple language the chief Natural Orders of Plants which embellish our world is now fulfilled: the attempt is accomplished, though in a very humble and imperfect manner. But so vast and varied is the mass of vegetation covering the land, filling the deep oceans and the shallow waters, that to select a few examples merely as guides to a more extended research in this wild field of study, is a perplexing task. Still the labour has been replete with interest and delight; the more we examine the glorious works of an Almighty Creator, the more we perceive their excellent beauty and endless variety. In our endeavours to comprehend something of His works, we cannot fail to observe not only the infinite power of the Creator, but the finite capacity of man. In striving to arrange Plants into tribes and groups, by which to obtain clearer views of their structure and properties, we find how countless are the links by which Nature connects all things together. Large classes may be formed of certain assimilating Plants for our guidance in botanical studies, but almost imperceptible chains combine them into one grand whole; there is not a plant in the entire range of vegetable life that has not affinity with others in structure and organization. Even the two great classes of Animals and Plants are so incomparably blended, that the most learned naturalists of this nineteenth century have scarcely yet accurately defined their respective limits. The lowest plant in the scale is a simple cell, with a few fine hairs, having a peculiar power of motion for a short space of time before it actually becomes a living, vegetating plant; thus for a time most closely connected with the Infusoria, the lowest form of animal life. In this, as in all other studies, the truth becomes clearly evident, that this world is intended as a place of learning, a time of searching after wisdom; and in this search we must ever be occupied for our own individual benefit, and, if possible, also for the aid and guidance of others. In taking a comprehensive survey of the natural tribes of Plants, as for the sake of distinction we call them, we may acquire more just and extended notions of their dispersion and varied utility. Very essential is this enlarged idea of all natural objects, especially in instructing the young. We esteem highly the advantage derived from the use of improved microscopes, which afford a more accurate insight into minute and complicated organizations. Valuable, also, is it to take a comprehensive view of the wide-spread vegetation of the world, not to confine our thoughts to one portion in our own country. A child soon learns to know the common Plants about his home; he sees Nettles, and is told they are useless weeds, and sting painfully. It would be well to teach, at the same time, that there are, in hotter countries, some plants very like them, which are of great use to the

natives; and that if we had not hemp and other plants with strong fibrous stalks from distant lands, we might make very good string and paper from the despised Stinging Nettles.

Concerning the structure of Plants, these Illustrations can only indicate the principal points; on pursuing the study, very remarkable arrangements will be evident, and the cause of several common appearances ascertained. The reason why leaves, which in spring are frequently withered at the points by frost, continue to enlarge afterwards, is because they grow always from the base, so are not impeded by partial check at the point or edges. The cause of roots being able to penetrate into very small crevices, is, that their power of growth is at their point. The vital force of vegetable matter in its earliest growth is immense in proportion to the size of the cells and the tender nature of simple cellular substance, not strengthened by fibrous tissue of any kind. A soft, succulent Fungus can make its way through the hard earth of a well-trodden road in dry weather. One of the most wonderful properties in the structure of Plants, is the power of absorbing moisture after long drought, and apparently a complete withering of their substance. This is exemplified in a very striking degree in *Anastatica Hierochuntia*, the Rose of Jericho, belonging to the Leguminous Tribe. It grows in the arid deserts of Palestine and Arabia; after flowering rolls up with the seed-vessels into a dry ball. The wind soon uproots it, for it has very slight hold in the sandy earth, and drives it along till it is finally deposited in some pool of water. There the dry tissue begins to expand with the moisture, the branches unroll, and the seeds, falling into the water, are prepared to germinate on the borders. The cells of vegetable tissue have, moreover, a strong power of contraction, which may be proved readily by one of the most common of weeds, found in every garden. On breaking the stalk of the Spurge, or Milkwort, the milky juice is expelled from each end, by the cells containing it immediately contracting.

The geographical distribution of Plants is a subject of extreme interest, and the observations to be made thereon add much to the pleasure of all travel. Mountain Plants more especially require suitable localities, and are in many cases obviously adapted to their exposed position, often clothed with fine down or hair, and having short, firm stalks, well calculated to resist wind. One of the most elegant specimens of our mountain Flora is *Primula farinosa*, to be seen on the hills of Yorkshire, growing also on the Alps, and, across the Atlantic, in North America. It will be found, likewise, in the most southern land of South America, near the Straits of Magellan, but nowhere on the intermediate hot plains; it traverses the vast continent from north to south, along the elevated chain of the Andes, where it meets with a favourable climate. Another curious fact connected with the geographical dispersion of Plants, is that some species belonging to Temperate countries gradually diminish in size approaching towards colder countries or more elevated situations. The tall Ash-tree of Britain becomes a mere shrub in the chilling atmosphere of Arctic regions. The Birch, growing to the height of forty feet in our moist woods, is not more than twenty feet high in the Pass of Killierankie, in the Scotch Highlands, below 57° of north latitude. In Iceland, in 62° of north latitude, it dwindles to a low bush of three or four feet. But if we turn our observations toward the Tropics, the change will be different; we shall find Nature developing her objects on a larger scale. What we have noticed in our native examples will appear like miniature specimens. All we know of the genus *Cuscuta* Dodder, here, is a little plant just springing out of the ground, but soon entangling its delicate slender threads, bearing small clusters of pale flowers over the Heath and Furze of the common; in the hot, damp jungles of India, this genus is expanded

into a species of vigorous growth and considerable size, climbing over forest trees with stems as large as small rope. The peculiar properties of some plants are more perfectly developed in some situations than in others; the aromatic qualities of Alpine plants particularly, require the pure air and uninterrupted rays of the sun. Certain plants we are accustomed to consider as merely ornamental, employing them only to adorn our gardens and houses with their gay flowers; Begonia is one of these, abundant in every conservatory, and not thought of as yielding any useful service; yet a traveller on the Himalaya mountains may find growing there a yellow-flowered Begonia, with succulent juicy stalks, which the natives cut up into pieces, and make therewith a pleasant acid sauce for their curries.

Besides the innumerable observations and topics of interest connected with the higher tribes of flowering Plants, the more humble and less developed are not without value as objects of study and inquiry. Even the lowly Fungus Tribe, to some known only as containing eatable Mushrooms or poisonous Puff-balls, is found on examination to be abounding in curious forms, and sometimes to possess also brilliancy of colour. The simplest species when magnified are seen to be of graceful form, exhibiting tracings of shape and pattern, equalling in beauty and elegance the most renowned designs of ancient art, and capable of affording valuable hints to modern artists. The common Fungus, known as *mould* on paste and other similar substances, is composed of fine filaments, bearing perfectly round heads full of minute spores, each complete in itself, though only one four-thousandth part of an inch in diameter. The Yeast Fungus which, in growing from granules of starch, evolves gas, and causes beer to ferment and dough to swell, is composed of globules the three-thousandth of an inch in diameter. So marvellous is the plan and structure of even the smallest object of vegetable creation.

Of the extensive Tribe of Sea-weeds it is impossible, within the narrow limits of a single page, to give more than a very slight idea, either by figures or words. The waters have their plentiful store of wonderful works as well as the land, and display very interesting objects to our notice. Many Sea-weeds possess considerable beauty when beheld in their native element; one of the most singular, and unknown on the British coast is *Claudea elegans*; the fronds bend gracefully, and are formed of an open network, in some spaces of which the clusters of spores are placed. The circular frond of *Martensia* has a border at the edge, having the appearance of lace. There are zones of particular Algæ, clearly defined: the Mediterranean has its own species of Sea-weeds, whilst different specimens are found in the Red Sea. Some produce their delicate branched fronds on rocks near the coast; others extend their unmeasured length in the deep waters of the Ocean.

Respecting the causes of colour in Plants, many points have yet to be studied and elucidated. We know not how or why some flowers change their hue during the short period of their existence: neither why others, as *Cobœa scandens*, should bear green flowers, which only become purple after they are fully expanded. Nor can we explain why one flower, as a Rose, has its full red hue even whilst the petals are closely enfolded in the calyx concealed from light. This is contrary to a theory concerning the red colour of flowers, which supposes that a strong and pure sunlight is necessary for the development of red. Therefore, in our temperate atmosphere of light and heat we have only two native red flowers, the Poppy and the Shepherd's Clock; whilst in the Tropics, flowers of the most brilliant crimson and scarlet tints abound. We can only observe the facts; chemists and botanists have yet many things to explain by their united researches. We cannot fully declare the reason why the power of acquiring blue colour should decline with the vigour of the plant; but we may remark that it is so. The first flowers on a plant of *Ipomœa*

purpurea, commonly known as *Convolvulus major*, are nearly all of a fine blue or purple, but towards the close of its existence in autumn, pink and white flowers prevail; if a blue flower is found, it will be of a very pale tint. So also with the Forget-me-not; it must have favourable circumstances for vigorous growth, to enable it to acquire the celestial hue for which it is so much admired. Place a plant of it in a vessel of water or earth under a glass, it will flourish for some time; but gradually as the flower-buds unfold, they will lose the property of becoming blue, and remain either pink, as all those flowers are in the bud, or become white. This is very remarkable, and so likewise is the fact, that blue-flowered Plants are the most apt to produce white varieties.

Not only does the contemplation of the various laws which regulate the organization of Plants fill our minds with wonder, but we must adore also the Wisdom which provides for the future as well as the present state of vegetation; marvellous is the ample provision made from the beginning of creation until now for the security of its continuance. "The fruit-tree yielding fruit after his kind, whose seed is in itself," was the work of the third day of creation; the word went forth, and is still obeyed. Notwithstanding the many casualties that are ever liable to befall plants and their seeds by animals or insects seeking them as food, yet no one is lost from the face of the earth. The fruit of the chesnut contains fourteen seeds, one or two only of which suffice to ripen.

Great truths are oftentimes revealed to us by very humble means. The actual living Plants of this present time tell of an omnipotent Creator; they lead also to the knowledge of the relics of a former vegetation, the work of the same eternal Maker, in ages beyond all other records. There are sealed herbals in the depths of our rocks and coal-mines which show us preserved examples of Ferns and various delicate foliage, kept safe amidst the overwhelming wreck of the world. After the lapse of countless ages again brought to light, they tell of the past, and make known the character of the Plants that adorned the earth in a former state of its existence. Sometimes a close similarity is perceptible between past and present species: in the Museum of Carlsruhe, in Germany, may be noticed a specimen of fossilized *Isoteles*, so nearly resembling that which now grows on the edges of pools in the neighbouring Black Forest, as to leave no doubt of its identity as a genus. In some countries parts of fossil Plants have been discovered, differing widely from those of the present time. The strata of the Isle of Sheppey, at the mouth of the Thames, contains the remains of fruits of Palms and other Tropical trees, which no longer grow in our Temperate regions. Thus Time, the destroyer, is also the preserver—soft fruits and fragile leaves, whose nature is to perish in a summer season, in the course of unnumbered years have been converted into rock, and thus destined to enlarge our knowledge of the past, and to prove the existence of vegetation in remote periods beyond the scope of our chronology. Whether we consider the giant trees of the Tropics, whose age is unknown, or the ephemeral Fungus, whose existence is but for a few hours on the surface of the earth, or penetrate into the hidden recesses of rocks and caverns, and behold the things that belong to the past, we are led to the one Source—to Him in whose sight a thousand years are but as yesterday, when it is past. The beautiful and innumerable proofs of Divine Wisdom displayed in the vegetable creation may well excite our unbounded admiration and reverence, and beholding the wondrous preparation of so many excellent things for the service of man, so much spread forth for our delight and enjoyment, with fulness of heart we may join in the ancient canticle, "O, all ye green things upon the earth, bless ye the Lord: praise Him, and magnify Him for ever."

Having thus brought the work of many years to an end, it remains only to express a humble hope that what has contributed to my knowledge and happiness, and been a chief refreshment in my pilgrimage, may be permitted to help others forward in the same path, leading amongst things and thoughts that bring unmingled delight and pure enjoyment. Nearly all the drawings have been made from nature, whenever living specimens could be procured, collected in various places. To the Royal Gardens at Kew, and the Botanic Gardens of London, as well as several private gardens, I have been largely indebted for examples of foreign plants. The native specimens have been culled in fields and woods in all parts of our country. From the unpublished drawings of Sir Robert Schomburgk I have been kindly allowed to copy the *Alexandra*, *Barbacenia*, and other rare South American flowers not yet to be seen in English gardens. From Dr. Lindley's "Vegetable Kingdom," Dr. Royle's "Illustrations of the Botany of the Himalaya," and several other published works on Plants, descriptive as well as illustrative, I derived much valuable assistance, endeavouring to extract and glean such materials as suited my purpose, rendering all into simple words that may be comprehensible to the unlearned, and, if possible, lead to greater pleasure from the possession of such beautiful gardens as are the undisputed pride of our island. Moreover, I trust in all humility, yet earnestly, that this mite, cast into the treasury, may be prospered in its results, and lead the ever active mind of the young to search diligently, each for himself, and to inquire with sincerity of purpose, and the true intention of the patriarch of Uz, "Where shall wisdom be found, and where is the place of understanding?"

E. T.

I N D E X.

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| <p>Abelia, 72
 Abelmoschus, 23
 Abroma, 25
 Abronia, 110
 Abutilon, 23
 Acacia, 49
 Acanthus, 105
 Acer, 30
 Achania, 23
 Achimenes, 82
 Achras, 87
 Achyranthes, 111
 Acnida, 112
 Acocanthera, 100
 Acorus, 148
 Acrocarpidium, 126
 Aerodictidum, 116
 Acrostichum, 154
 Actæa, 1
 Actinocarpus, 131
 Adansonia, 26
 Adenandra, 44
 Adiantum, 154
 Adlumia, 7
 Adoxa, 71
 Æchmea, 138
 Ægiceras, 86
 Ægialitis, 108
 Æginetia, 103
 Ægle, 41
 Ærides, 132
 Æschynanthus, 82
 Æsculus, 29
 Agapanthus, 141
 Agaricus, 159
 Agathea, 76
 Agathophyllum, 116
 Agathotes, 94
 Agave, 136
 Agrimonia, 51
 Agrostemma, 69
 Agrostis, 150
 Aizoon, 63
 Alangium, 59
 Alaria, 160
 Aldrovanda, 18
 Alettris, 135
 Alexandra, 49
 Alfonsia, 145
 Alisma, 131
 Allium, 141</p> | <p>Allmannia, 111
 Alloplectus, 82
 Aloe, 141
 Alpinia, 133
 Alsodea, 15
 Alsophila, 154
 Alströmeria, 136
 Alternanthera, 111
 Althea, 23
 Alyssum, 11
 Alyxia, 92
 Amanita, 159
 Amarantus, 111
 Amaryllis, 136
 Ameletia, 54
 Ammannia, 54
 Amorphallus, 148
 Ampelopsis, 37
 Amphibolis, 151
 Amphicome, 95
 Amygdalus, 53
 Anacardium, 48
 Anacharis, 130
 Anacyclus, 76
 Anagallis, 107
 Anastatica, 11
 Anchusa, 98
 Anda, 123
 Andræa, 155
 Andromeda, 84
 Androsace, 107
 Androsæmum, 33
 Aneilema, 143
 Anemia, 154
 Anemone, 1
 Anethum, 70
 Aneura, 156
 Anigozanthus, 135
 Anneslea, 42
 Anona, 4
 Anthemis, 76
 Anthoceros, 156
 Antiaria, 124
 Antirrhinum, 101
 Aphelandra, 105
 Aphlora, 13
 Apium, 70
 Apocynum, 92
 Apodytes, 43
 Aquilegium, 1
 Aralia, 71</p> | <p>Aramodendron, 3
 Araucaria, 128
 Arbutus, 84
 Arctium, 76
 Ardisia, 86
 Areca, 145
 Arenaria, 69
 Aresia, 107
 Argemone, 9
 Arisæma, 148
 Aristolochia, 122
 Aristotelia, 27
 Armeria, 108
 Artabotrys, 4
 Artanthe, 126
 Artemisia, 76
 Artocarpus, 124
 Arum, 148
 Arundo, 150
 Asagræa, 142
 Asarum, 122
 Aselepias, 92
 Ascyrum, 33
 Asparagus, 140
 Asperula, 74
 Aspidospermum, 92
 Asplenium, 154
 Astelia, 144
 Asteranthus, 85
 Astragalus, 49
 Astrantia, 70
 Astrapæa, 25
 Astrephia, 75
 Astronia, 56
 Atriplex, 112
 Atropa, 100
 Avena, 150
 Averrhoa, 19
 Avicennia, 104
 Azolla, 153</p> | <p>Bellis, 76
 Benthamia, 72
 Benzoin, 116
 Berberis, 6
 Berchæmia, 47
 Berrya, 27
 Bertholletia, 58
 Beta, 112
 Betonica, 102
 Betula, 127
 Bignonia, 95
 Bilbergia, 138
 Billardiera, 20
 Bixa, 13
 Blakea, 56
 Blitum, 112
 Bocagea, 4
 Bolax, 70
 Bolbophyllum, 132
 Boletus, 150
 Bolivaria, 90
 Bombax, 26
 Boerhaavia, 110
 Boottia, 130
 Borago, 98
 Borreria, 44
 Botrychium, 154
 Botrydium, 160
 Botrytis, 159
 Bougneria, 109
 Bovista, 159
 Brabejum, 118
 Brachycarpea, 11
 Bragantia, 122
 Bramia, 101
 Brassica, 11
 Brayera, 51
 Briza, 150
 Bromelia, 138
 Brosimum, 124
 Broussonetia, 124
 Browallia, 101
 Brucea, 45
 Brugmansia, 100
 Bruguiera, 93
 Brunonia, 79
 Brunswigia, 136
 Bryonia, 61
 Bryophyllum, 67
 Brysophila, 67
 Bryum, 155</p> |
|---|--|---|--|

- Bubroma, 25
 Buchnera, 101
 Bucida, 59
 Buddlea, 101
 Bugainvillea, 110
 Bumelia, 87
 Bunchosia, 31
 Bupleurum, 70
 Bursaria, 20
 Buxus, 123
 Byblis, 18
 Byrsonima, 31
 Byttneria, 25

 Cactus, 65
 Caladium, 148
 Calamus, 145
 Calandrinia, 64
 Calceolaria, 101
 Calceolaria, 101
 Calceolaria, 101
 Calla, 148
 Calliandra, 104
 Calligonum, 115
 Calluna, 84
 Calophyllum, 34
 Calosaceae, 82
 Calystegia, 97
 Camarotis, 132
 Camelina, 11
 Camellia, 42
 Cameraria, 92
 Campanula, 80
 Camphora, 116
 Canarina, 80
 Candollea, 2
 Canna, 133
 Cannabis, 125
 Capparis, 12
 Caprifolium, 72
 Capsicum, 100
 Carapa, 42
 Carallia, 93
 Carapa, 40
 Cardamine, 11
 Cardiospermum, 28
 Careya, 57
 Carex, 149
 Carissa, 92
 Carlina, 76
 Carludovica, 146
 Carpodinus, 92
 Carthamus, 76
 Cartonema, 143
 Carum, 70
 Carya, 50
 Caryophyllus, 57
 Casearia, 46
 Cassia, 49
 Cassytha, 116
 Castanea, 127
 Catalpa, 95
 Catananche, 76
 Cattleya, 132
 Caulophyllum, 6
 Cayusea, 17
 Ceanothus, 47
 Cecropia, 124
 Cedrela, 39

 Celosia, 111
 Cenomyce, 158
 Centaurea, 76
 Centranthus, 75
 Centropogon, 81
 Centrostachys, 111
 Cephalaria, 77
 Cephalis, 74
 Ceradia, 76
 Cerastium, 69
 Cerasus, 53
 Ceratonia, 49
 Ceratostigma, 108
 Cerbera, 92
 Cereus, 65
 Cerinthe, 98
 Ceroxylon, 145
 Cetraria, 158
 Chamærops, 145
 Chamissoa, 111
 Chara, 157
 Chavica, 126
 Cheilanthes, 154
 Cheiranthra, 20
 Cheiranthus, 11
 Cheirotomon, 26
 Chelidonium, 9
 Chelone, 101
 Chenopodium, 112
 Chickrassia, 39
 Chirita, 82
 Chironia, 94
 Chlora, 94
 Chloroxylon, 39
 Chondodendron, 5
 Chrysobactron, 141
 Chrysobalanus, 53
 Chrysophyllum, 87
 Chrysosplenium, 68
 Chuncoa, 59
 Chymocarpus, 24
 Cichorium, 76
 Cicutia, 70
 Cinchona, 74
 Cinnamomum, 116
 Cistaceae, 62
 Cissampelos, 5
 Cissus, 37
 Cistanche, 103
 Cistus, 22
 Citriobatus, 20
 Citrus, 41
 Cladostachys, 111
 Clarkia, 62
 Claviga, 86
 Claytonia, 64
 Clematis, 1
 Cleome, 12
 Clerodendron, 104
 Clintonia, 81
 Clusia, 34
 Cobaea, 96
 Coccoloba, 115
 Coccoloba, 115
 Coccoloba, 115
 Cochlearia, 11
 Cocos, 145

 Codon, 99
 Codonopsis, 80
 Cologyne, 132
 Coffea, 74
 Coix, 150
 Colchicum, 142
 Colicodendron, 12
 Collomia, 96
 Colophora, 92
 Colocasia, 146
 Columnea, 82
 Combretum, 59
 Comesperma, 16
 Commelina, 143
 Comptonia, 121
 Conium, 70
 Conocarpus, 59
 Conohoria, 70
 Convallaria, 140
 Convolvulus, 97
 Cookia, 41
 Coprosma, 74
 Corchorus, 27
 Coriandrum, 70
 Cornus, 72
 Correa, 44
 Corydalis, 7
 Corylus, 127
 Corynostylis, 15
 Corypha, 145
 Coscinium, 5
 Cosmea, 76
 Cotoneaster, 51
 Couratari, 58
 Couroupita, 58
 Grambe, 11
 Crassula, 67
 Crataegus, 52
 Crataeva, 12
 Cratoxylon, 33
 Cremanium, 56
 Crinum, 136
 Crithmum, 70
 Crocus, 137
 Crotalaria, 49
 Croton, 123
 Crozophora, 123
 Cryptandra, 47
 Cryptocarya, 116
 Cryptogramma, 154
 Cryptomeria, 128
 Cubeba, 126
 Cucumis, 61
 Cueurbita, 61
 Cuphea, 54
 Cupressus, 128
 Curatella, 2
 Cureuma, 133
 Cusparia, 44
 Cycas, 129
 Cyananthus, 96
 Cyanotis, 143
 Cyathus, 159
 Cyclamen, 107
 Cyclanthus, 146
 Cydonia, 52
 Cymbidium, 132
 Cynanchum, 92

 Cynara, 76
 Cynoches, 132
 Cynoglossum, 98
 Cyperus, 149
 Cyphia, 80
 Cyrilla, 82
 Cysticarpus, 7
 Cystandra, 82

 Dactylicarpus, 7
 Daetilis, 150
 Dais, 119
 Damasonium, 131
 Dampiera, 79
 Danæa, 154
 Daphne, 119
 Datura, 100
 Daucus, 70
 Davallia, 154
 Deeringia, 111
 Delesseria, 160
 Delima, 2
 Delphinium, 1
 Dendrobium, 132
 Desmodium, 111
 Dianthus, 69
 Diapensia, 107
 Dicentra, 7
 Dichorisandra, 143
 Dicytra, 7
 Dieracium, 156
 Dictamnus, 44
 Dieckmannia, 116
 Didymocarpus, 82
 Dielffenbachia, 148
 Dielytra, 7
 Digera, 111
 Digitalis, 101
 Dilatris, 135
 Dillenia, 2
 Dion, 129
 Dionea, 18
 Dioscorea, 139
 Diospyros, 88
 Diphylleia, 6
 Diploclinium, 114
 Diplopteris, 31
 Dipsacus, 77
 Dipterocarpus, 35
 Dipterix, 49
 Dirca, 119
 Disa, 132
 Discaria, 47
 Disemma, 14
 Ditassa, 123
 Dobinea, 30
 Dodecatheon, 107
 Dodonea, 28
 Dombeya, 25
 Dorstenia, 124
 Doryanthes, 136
 Doryopteris, 154
 Douglasia, 107
 Draba, 11
 Dracena, 140
 Dracontium, 148
 Diapetes, 119
 Drosera, 18

- Drosophyllum*, 18
Dryandra, 118
Dryas, 51
Drymis, 3
Dryobalanops, 35
Duriæa, 156
Durio, 26
Dervillæa, 160
Duvaua, 48
Dysoxylon, 40

Eccremocarpus, 95
Echinocactus, 65
Echinops, 76
Echium, 98
Elæagnus, 121
Elæocarpus, 27
Elæocharis, 149
Elæococca, 123
Elais, 145
Elichrysum, 76
Ellisia, 29
Elodea, 33
Eleuthera, 123
Embelia, 86
Emblia, 123
Encephelartos, 129
Engelhardtia, 50
Epidendrum, 132
Epilobium, 62
Epimedium, 6
Epiphegus, 103
Epiphyllum, 65
Equisetum, 152
Erica, 84
Erineum, 159
Eriobotrya, 52
Eriogonum, 115
Eriophorum, 149
Eriolæna, 25
Erodium, 38
Erpetion, 15
Eryngium, 70
Erysinum, 11
Erythræa, 94
Erythrochiton, 44
Esenbeckia, 44
Encalyptus, 57
Eugenia, 57
Eupetalum, 114
Euphorbia, 123
Euphrasia, 101
Eurya, 42
Euryale, 8
Euthales, 79
Eutoca, 99
Evosmia, 74
Exacum, 94

Fadeynia, 154
Fagopyrum, 115
Fagraea, 91
Fagus, 127
Farsetia, 11
Fedia, 75
Feronia, 44
Ferula, 70
Festuca, 150

Feuillæa, 61
Ficus, 124
Fieldia, 82
Flacourtia, 13
Flagellaria, 143
Flindersia, 39
Forstera, 78
Fourcroya, 136
Fraxinus, 89
Freycinetia, 146
Fritillaria, 143
Fuchsia, 62
Fucus, 160
Fuirena, 149
Fumaria, 7
Furcellaria, 160
Fusanus, 120

Galanthus, 136
Galbanum, 70
Galeandra, 132
Galeobdolon, 102
Galipea, 44
Galium, 74
Garcinia, 34
Gaylussacia, 83
Gendarussa, 105
Genipa, 74
Genlisea, 106
Gentiana, 94
Geranium, 38
Gesnera, 82
Gieseckia, 113
Gilia, 96
Gillenia, 51
Glaucium, 9
Gladiolus, 137
Gloriosa, 142
Gloxinia, 82
Glycosmis, 41
Glycyrrhiza, 49
Gmelina, 104
Gnaphalium, 76
Gnidia, 119
Gomphrena, 111
Goodenia, 79
Gordonia, 41
Gossypium, 23
Grevillea, 118
Grewia, 27
Grislea, 54
Gualteria, 84
Guarea, 40
Guatteria, 4
Guevina, 118
Guizotia, 76
Gymnema, 92
Gymnogramma, 154
Gynerium, 150
Gyrophora, 158
Gysophila, 69

Haberlen, 82
Hakea, 118
Haplophyllum, 44
Hartighsea, 40
Hasseltia, 92
Hemanthus, 136

Hæmodorum, 135
Hedera, 71
Hedychium, 133
Heimia, 54
Heisteria, 43
Heliamphora, 10
Helianthemum, 22
Heliconia, 134
Helicteres, 26
Heliotropium, 98
Helleborus, 1
Helminthia, 76
Helonias, 142
Hemerocallis, 141
Hepatica, 1
Heracleum, 70
Hermannia, 25
Herpestes, 101
Hesperis, 11
Heteropteris, 31
Heuchera, 68
Hibbertia, 2
Hibiscus, 23
Himanthalia, 160
Hippeastrum, 136
Hippocratea, 32
Hippomane, 123
Hippophæ, 121
Hiptage, 31
Hirea, 31
Hollbolia, 5
Hopea, 35
Hordeum, 150
Hortia, 44
Hottonia, 107
Hoya, 97
Hudsonia, 22
Humulus, 125
Huntleya, 132
Hyalostemma, 117
Hydnocarpus, 13
Hydrocharis, 130
Hydrolea, 99
Hydrophyllum, 99
Hydrilla, 130
Hymenanchera, 15
Hymenea, 49
Hymenophyllum, 154
Hymenopogon, 74
Hymenostoma, 155
Hyoscyamus, 100
Hypericum, 33
Hyphæne, 145
Hypnum, 155

Iacina, 43
Iberis, 11
Ignatia, 91
Illicium, 3
Ionidium, 15
Imbricaria, 87
Incarvillea, 95
Inocarpus, 119
Ipomea, 97
Iriarteia, 145
Iridæa, 160
Iris, 137
Isatis, 11

Isnardia, 62
Isoetes, 153
Isolepis, 149
Isonandra, 87
Isotoma, 81
Ixia, 137
Ixora, 74

Jacaranda, 95
Jacquinia, 86
Jasione, 80
Jasminum, 90
Jatropha, 123
Johnia, 32
Juanulloa, 100
Juglans, 50
Juncus, 144
Jungermannia, 156
Juniperus, 128
Jussiaea, 62
Justicia, 105

Kæmpferia, 133
Kalanchoe, 67
Kalmia, 84
Kandelia, 93
Khaya, 39
Kielmeyera, 42
Klaprothia, 60
Klugia, 82
Knaulia, 77
Kohautia, 74
Kreysigia, 142
Kydia, 25
Kyllingia, 149

Lacnanthes, 135
Lætia, 13
Lagerstræmia, 54
Lagetta, 119
Laguncularia, 59
Laminaria, 160
Lamium, 102
Lansium, 40
Lantana, 104
Lardizabala, 5
Lasiandra, 56
Lasiopetalum, 25
Lathræa, 103
Laurus, 116
Lavandula, 102
Lawsonia, 54
Lecanora, 158
Lechea, 22
Lechenaultia, 79
Lecythis, 58
Ledum, 84
Leea, 37
Leianthes, 94
Lemna, 148
Leontice, 6
Lepidium, 11
Leptomeria, 120
Leptosiphon, 96
Leptospermum, 57
Lepuranda, 124
Leucodon, 155
Leucolæna, 70

- Leucospermum*, 118
Lexenhookia, 78
Lewisia, 63
Leycesteria, 72
Lichtensteinia, 70
Ligustrum, 89
Lilium, 141
Limnanthes, 21
Limncharis, 131
Limonia, 41
Limosella, 101
Linaria, 101
Linum, 21
Liriodendron, 3
Lisianthus, 94
Lithospermum, 98
Littaea, 136
Littorella, 109
Loasa, 60
Lobelia, 81
Lomatia, 118
Lonicera, 72
Lopezia, 62
Lophospermum, 101
Loranthus, 73
Luciola, 144
Lucuma, 87
Lunaria, 11
Lunularia, 156
Lychnis, 69
Lycopodium, 153
Lysimachia, 107
Lythrum, 54

Maba, 88
Maclura, 124
Macropiper, 126
Macrocytis, 160
Madia, 76
Magallana, 24
Magnolia, 3
Malope, 23
Malpighia, 31
Malva, 23
Mamillaria, 65
Mammea, 31
Mangifera, 48
Manihot, 123
Mantisia, 133
Manulea, 101
Maranta, 133
Marchantia, 156
Marcgraavia, 36
Mariscus, 149
Marsilea, 153
Mathiola, 11
Maurandya, 101
Mauritia, 145
Mecynopsis, 9
Medeola, 140
Medicago, 49
Medinilla, 56
Melaleuca, 57
Melampyrum, 101
Melanorrhæa, 48
Melanthium, 142
Melastoma, 56
Melhania, 25

Melia, 40
Meliceæ, 28
Melissa, 102
Menocylon, 56
Mendozia, 105
Menispermum, 5
Mentha, 102
Mentzelia, 60
Menyanthes, 94
Mesembryanthemum, 63
Mespilus, 52
Mesua, 34
Metrosideros, 57
Michauxia, 80
Michelia, 3
Miconia, 56
Microsperma, 60
Mikania, 76
Milnea, 40
Mimosa, 49
Mimulus, 101
Minusops, 87
Mirabilis, 110
Misodendron, 73
Modeceæ, 14
Mollugo, 69
Momordica, 61
Monnina, 16
Monstera, 148
Montia, 64
Moræa, 137
Morchella, 159
Moricandia, 11
Morina, 77
Morinda, 74
Moronobea, 34
Morus, 124
Mucor, 159
Muhlenbeckia, 115
Mundia, 16
Muraltia, 16
Murdannia, 143
Musa, 134
Mussaenda, 74
Mylitta, 159
Myoporum, 104
Myoschilus, 120
Myosotis, 98
Myrica, 121
Myricaria, 55
Myristica, 117
Myrrhimum, 56
Myrsine, 86
Myrtus, 56

Naias, 151
Nana, 99
Nandina, 121
Napoleona, 85
Narcissus, 136
Nardostachys, 75
Narthecium, 144
Nasturtium, 11
Neetandra, 116
Negundo, 30
Nelumbium, 8
Nemophila, 99

Nephelium, 28
Nerium, 92
Nerteria, 74
Nicotiana, 100
Nidularia, 159
Nierembergia, 100
Nigella, 1
Nima, 45
Nipa, 146
Nitella, 157
Nivenia, 118
Norantea, 36
Nuphar, 8
Nuytsin, 73
Nyctanthus, 90
Nymphæa, 8
Nyssa, 59

Ochradenus, 17
Ocymum, 102
Oeanthe, 70
Oenothera, 62
Olax, 43
Oldenlandia, 74
Olea, 89
Oncidium, 132
Oncoba, 13
Oncus, 139
Onopordum, 76
Onosmodium, 98
Ophrys, 132
Ophiocaryon, 28
Ophioglossum, 154
Ophiogon, 140
Oplotecha, 111
Opopanax, 70
Opuntia, 65
Orchis, 132
Oreodaphne, 116
Ornithogalum, 141
Orobanche, 103
Orthotrichum, 155
Oryza, 150
Osbeckia, 56
Osmunda, 154
Osyris, 120
Ouviranda, 151
Oxalis, 19
Oxleya, 39
Oxycoceus, 83
Oxyria, 115

Paliurus, 47
Panax, 71
Pancratium, 136
Pandanus, 146
Panicum, 150
Papaver, 9
Pappea, 28
Papyrus, 149
Parietaria, 125
Parinarium, 53
Paris, 140
Parmelia, 158
Parnassia, 33
Paropsia, 14
Passerina, 119
Passiflora, 14

Pastinaca, 70
Patrinia, 75
Paullinia, 28
Paulownia, 101
Pavia, 29
Pavonia, 23
Pelargonium, 38
Pellia, 156
Pemphis, 54
Pentadesma, 34
Pentaloba, 15
Pentaptera, 59
Peperomia, 126
Peplis, 54
Pereskia, 65
Persea, 116
Persica, 56
Persoonia, 118
Petrocallis, 11
Petrophila, 118
Petunia, 100
Peziza, 159
Phoenix, 145
Phaius, 132
Phalaris, 150
Phalenopsis, 132
Pharbitis, 97
Phaylopsis, 105
Phelipea, 103
Phellandrium, 70
Philippodendron, 25
Phleum, 150
Phlomis, 102
Phormium, 141
Photinia, 52
Phycella, 136
Phylla, 47
Phylloglossum, 153
Phyllirea, 89
Physalis, 100
Physocalymma, 54
Physostemon, 12
Phytelephas, 145
Phyteuma, 80
Phytocrene, 124
Phytolacca, 113
Pieræna, 45
Pierorhiza, 101
Pilocereus, 65
Pilularia, 153
Pimelea, 119
Pimpinella, 70
Pinekneya, 74
Pinguicula, 106
Pinus, 128
Piper, 126
Piptostegia, 97
Pisonia, 110
Pistacia, 48
Pistia, 148
Pisum, 49
Pitcairnia, 138
Pittosporum, 20
Pitumba, 46
Plantago, 109
Platyloma, 154
Platystemon, 9
Plectocomia, 145

- Pleroma, 56
 Plumbago, 108
 Plumiera, 92
 Poa, 150
 Poinsettia, 123
 Polanisia, 12
 Polemonium, 96
 Polianthes, 141
 Polyalthia, 4
 Polygala, 16
 Polygonatum, 140
 Polygonum, 115
 Polyosma, 66
 Polypodium, 154
 Polyporus, 159
 Polyscalis, 111
 Polytichum, 155
 Pomaderris, 47
 Populus, 127
 Porphyrocoma, 105
 Portulacca, 64
 Potalia, 91
 Potamogeton, 151
 Poterium, 51
 Pothos, 148
 Prangos, 70
 Premna, 104
 Primula, 107
 Prionum, 144
 Protea, 118
 Protococcus, 160
 Psidium, 57
 Pteris, 154
 Pterisanthes, 37
 Pterocarya, 50
 Pulmonaria, 98
 Punica, 57
 Pupalia, 111
 Puya, 138
 Pyrrhosa, 117
 Pyralaria, 120
 Pyrus, 52
 Pythonium, 148

 Quercus, 127
 Quillaja, 51

 Radiola, 21
 Rayania, 139
 Ramalina, 158
 Ramondia, 82
 Ranunculus, 1
 Raphanus, 11
 Reboulia, 156
 Reptonia, 86
 Reseda, 17
 Rhamnus, 47
 Rheum, 115
 Rhinanthus, 101
 Rhipsalis, 65
 Rhizomorpha, 159
 Rhizophora, 93
 Rhodiola, 67
 Rhododendron, 84
 Rhodomenia, 160
 Rhus, 49
 Ribes, 66
 Riccia, 156

 Richardia, 148
 Ricinus, 123
 Rivina, 113
 Robinia, 49
 Roccella, 158
 Roellia, 80
 Romanzovia, 99
 Rondeletia, 74
 Rosa, 51
 Rotala, 54
 Royena, 88
 Rubia, 74
 Rubus, 51
 Ruellia, 105
 Rumex, 115
 Ruscus, 140
 Ruta, 44
 Ruyschia, 36
 Ryssopteris, 31

 Saccharum, 150
 Sageretia, 47
 Sagittaria, 131
 Sagus, 145
 Salacia, 32
 Salicornia, 112
 Salix, 127
 Salomonia, 16
 Salpiglossis, 100
 Salsola, 112
 Salvia, 102
 Salvinia, 153
 Samadera, 45
 Sambucus, 72
 Samolus, 107
 Samyda, 40
 Sanguinaria, 9
 Sanguisorba, 51
 Santalum, 120
 Santolina, 76
 Sapindus, 28
 Saponaria, 69
 Sarcocapnos, 7
 Sarcocaulon, 38
 Sarcocephalus, 74
 Sarcostemma, 92
 Sargassum, 160
 Sarracenia, 10
 Sassafra, 116
 Saxifraga, 68
 Scabiosa, 77
 Scavola, 79
 Scandix, 70
 Schebera, 95
 Schinus, 48
 Schizanthus, 101
 Schomburgkia, 132
 Schubertia, 128
 Scilla, 141
 Scindaspus, 148
 Scirpus, 149
 Scleroderma, 159
 Scolopendrium, 154
 Scoparia, 101
 Scorzonera, 76
 Scrophularia, 101
 Scutellaria, 102
 Seythalia, 160

 Seytosiphon, 160
 Secale, 150
 Securidaca, 16
 Sedum, 67
 Selliera, 79
 Semecarpus, 48
 Semperivum, 67
 Serjania, 28
 Sesuvium, 63
 Shorea, 35
 Sibthorpia, 101
 Sicyos, 61
 Sida, 23
 Sieversia, 51
 Silene, 69
 Simaba, 45
 Simaruba, 45
 Siphocampylos, 81
 Siphonia, 123
 Sisyrinchium, 137
 Smeathmannia, 14
 Smilacina, 140
 Smilax, 140
 Sobralia, 132
 Sodada, 12
 Solanum, 100
 Sonerila, 56
 Sonneratia, 57
 Sorghum, 150
 Soulaamea, 16
 Soyaida, 39
 Sparaxis, 137
 Sparmannia, 27
 Sparganium, 147
 Spartium, 49
 Spergula, 69
 Sphragnum, 155
 Spigelia, 91
 Spirea, 51
 Splachnum, 155
 Spondias, 48
 Stachytarpheta, 104
 Stapelia, 92
 Statice, 108
 Stauntonia, 5
 Stellaria, 69
 Stenocarpus, 118
 Stenodon, 56
 Sterculia, 26
 Stereocaulon, 158
 Sternbergia, 136
 Stricta, 158
 Stigmaphyllon, 31
 Stillingia, 123
 Stratiotes, 130
 Strelitzia, 134
 Streptocarpus, 82
 Streptopus, 140
 Striga, 101
 Strobilanthes, 105
 Strychnos, 91
 Stuartia, 42
 Stylidium, 78
 Subularia, 11
 Sumatrana, 15
 Suttonia, 86
 Swietenia, 39
 Symphoria, 72

 Symphytum, 98
 Syringa, 89

 Tabernaemontana, 92
 Taesonia, 14
 Talauma, 3
 Tamarix, 55
 Tamus, 139
 Tanghinia, 92
 Taraxacum, 76
 Targionia, 156
 Tasmannia, 3
 Taxus, 128
 Tecoma, 95
 Tectona, 104
 Teedia, 101
 Telfairia, 61
 Telepea, 118
 Terminalia, 59
 Ternstroemia, 42
 Tessandra, 89
 Testudinaria, 139
 Tetracera, 2
 Tetragnolobus, 49
 Tetragnonia, 63
 Thlaspi, 11
 Thea, 42
 Theobroma, 25
 Theophrasta, 86
 Thelygonum, 112
 Thesium, 120
 Thibaudia, 83
 Thunbergia, 105
 Thymus, 102
 Tiarella, 68
 Ticorea, 44
 Tigridia, 137
 Tilia, 27
 Tillandsia, 138
 Tococo, 56
 Tontelea, 32
 Torenia, 101
 Tormetilla, 51
 Tournefortia, 98
 Tradescantia, 143
 Trichilia, 40
 Trichodesma, 98
 Tricosanthes, 61
 Trientalis, 107
 Trifolium, 49
 Triglochin, 151
 Trigonocarpus, 95
 Trigonina, 16
 Trillium, 140
 Triphasia, 41
 Triplaris, 115
 Triplostegia, 75
 Tristemma, 56
 Triticum, 150
 Trollius, 1
 Tropaeolum, 24
 Tuber, 159
 Talipa, 141
 Tupa, 81
 Turrea, 40
 Tussilago, 76
 Typha, 147

- | | | | |
|------------------|-------------------|-------------------|-------------------|
| Ulva, 160 | Vangueria, 74 | Viscum, 73 | Xanthorrhoea, 141 |
| Urania, 134 | Vanilla, 132 | Vismia, 33 | Xerotes, 144 |
| Urecola, 92 | Variolaria, 158 | Vitex, 104 | Ximenia, 43 |
| Urena, 23 | Vateria, 35 | Vitis, 37 | Xylopia, 4 |
| Urtica, 125 | Velleia, 79 | Vogelia, 108 | |
| Urvillea, 28 | Vellozia, 135 | | Yucca, 141 |
| Usnea, 158 | Veratrum, 142 | Wahlenbergia, 80 | |
| Utricularia, 106 | Verbascum, 100 | Waltheria, 25 | Zamia, 129 |
| Uvaria, 4 | Verbena, 104 | Wellingtonia, 128 | Zannichellia, 151 |
| Uvularia, 142 | Veronica, 101 | Whitlavia, 99 | Zanonia, 61 |
| | Verticillaria, 34 | Wiegela, 72 | Zea, 150 |
| Vaccinium, 83 | Viburnum, 72 | Wightia, 95 | Zingiber, 133 |
| Vahea, 92 | Victoria, 8 | Willughbeia, 92 | Zinnia, 76 |
| Valeriana, 75 | Villarsia, 94 | Wistaria, 49 | Zizyphus, 47 |
| Vallesia, 92 | Vinca, 92 | | Zostera, 151 |
| Vallisneria, 130 | Viola, 15 | Xanthochymus, 34 | |
| Vandelia, 101 | Virola, 117 | Xanthophyllum, 16 | |

THE END.

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